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CONTENTS.

EDITORIAL NOTES.

In Defence of the Power Sub-Committee's Report . . . 17
Protecting the Secondary Products Interests. 18
Lighting again to the Fore 18
Methane Content of Gas 19
Capital Issues and Industrial Requirements —The Coal Position. 19
Salaries of Gas Officials—A Strong Move Necessary—Injustice and Super-Difficulties at Buenos Aires—Sliding-Scale Gas Prices Based on Cost of Coal 20

Masonic—Evening Star Lodge, No. 1719. . 20
Personal 21
Obituary—Andrew Dougall 21
Steaming Horizontal and Inclined Retorts, or "Constructive Distillation." By H. J. Toogood 22
Financial Aid for French Gas Undertakings. 23
Electricity Supply Memoranda 23
Coal and its Conservation—Power Supply as a Reconstruction Problem. Prof. W. A. Bone's Third Cantor Lecture 24
Presentation to Mr. R. S. Tobey 27
Coke-Oven Managers' Association—Midland Section 28
Yorkshire Junior Gas Association — The Group or Duct System of Lighting. By F. Pykett 30

CORRESPONDENCE.

Prof. Bone and the Thermal Efficiency of Electric Power Stations 33
Thermal Efficiency v. Cost 33
Salaries in the Gas Industry. 33

PARLIAMENTARY INTELLIGENCE.

House of Lords—
Progress of Bills. 33
House of Commons—
Progress of Bills. 33
Electrical Power Report 33
Benzol Extraction from, and Inerts in, Gas 33
Marketing of Benzol and Other Motor Spirit 33
House of Lords Committee—Brentford Gas Bill 34
Swinton and Mexborough Gas Board Bill. . 34
Local Authorities (Enabling) Bill 34

MISCELLANEOUS NEWS.

Sulphate of Ammonia Selling Scheme—The Project Discussed in London. 37
British Gas Light Company, Ltd. 38
Anglo-Persian Oil Company, Ltd.—Ninth Ordinary General Meeting—Very Satisfactory Report and Accounts. 40
Primitiva Gas Company of Buenos Aires, Ltd.—A War Time Fall from a Strong Financial Position—The Chairman Visiting Buenos Aires. 42
South Metropolitan Co-Partnership Scheme. 43
Current Sales of Gas Products 44
Fraudulent Consumption of Gas 45
Leamington Priors Gas Company 45
Rhode Island and Municipal Ownership . . 46
Action against the Gas Light and Coke Company 46
Torquay Gas Company's Diamond Jubilee . 47
Stock Market Report 48

REGISTER OF PATENTS.

Producing Gas from Lignite—Marks, E. C. R. (Società Anonima Italiana Gio. Ansaldo) . 35
Gas-Meters—Anderson, E. E. W. 35
Measuring Gases—Cockey, F. G., and the Gas-Meter Company, Ltd. 35
Automatically Controlling the Supply of Gas to Lighting and Heating Installations—Scott-Snell, C. 36
Feeding the Furnaces of Gas-Retort Settings, &c.—Masters, E., and Gibbons Bros., Ltd. 36
Applications for Patents 49

PARAGRAPHS.

Eastern Counties Gas Managers' Association —New Capital Issues 27
Industrial Reconstruction and the Metric System 32
Sale of Gas at Bishop's Stortford—Bexhill Water and Gas Company 34
Conway Gas-Works without Coal—Gas-Workers' Wages at Torquay and Exmouth 42
Dearer Gas at Exeter—Gas-Workers' Wages at Tiverton—Woking District Gas Company — New Geysers, Ltd. — Technical Chemists and Whitley Councils 45
Vertical Retorts for Halifax—Increase in Gas Prices at Rochdale—Criticism at Staveley—Gas-Meter Makers' Wages — German Workers and Nationalization—Admiralty's Huge Oil Fuel Reservoir 46
War Increase at Abertillery—Exmouth Gas Company — Higher Yorkshire Prices—Added Financial Strength at Cromer—Gas-Works Extensions at Colchester 47
Jubilee at Batley—An Income-Tax Commission—Price of Gas at Glasgow—Shipley Gas-Works Deficit 48

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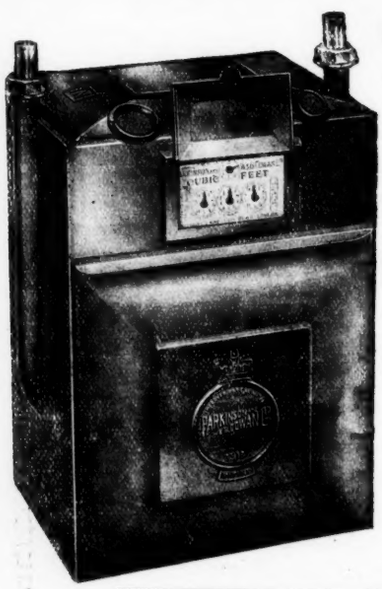

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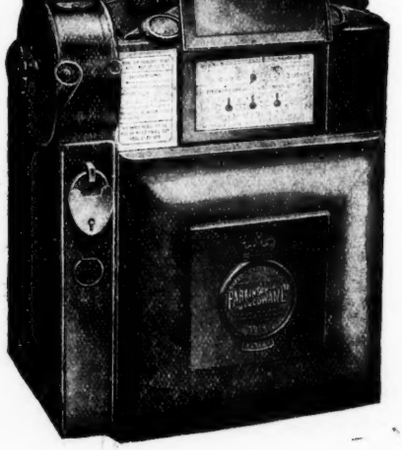

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VOL. CXLVI., No. 2916.] TUESDAY, APRIL 1, 1919. [71ST YEAR.

EDITORIAL NOTES.

In Defence of the Power Sub-Committee's Report.

IN his third Cantor Lecture, Prof. W. A. Bone, still dealing with the utilization of the country's coal resources, carefully defined the conclusions he has arrived at in relation to the problems of heating and power. His view is that heating is for gas; while power is something which should be dealt with collectively, and can be done most conveniently by electrical means. In the determination as to heating, Prof. Bone accompanies Lord Moulton, Sir Dugald Clerk, and many other authorities (including popular choice) in the opinion that gas has many proved economical advantages that completely overwhelm electricity. Nobody but the very wealthy can afford to use electricity for general heating; and when one considers the waste of the potential energy of coal from the time it is put under the boiler at the electricity station for the production of heat for the production of steam, which is utilized in an engine or turbine for driving a dynamo for generating electricity, which is again turned back into heat, it is seen that the thermal waste is of dimensions that are not good for the country, and only the mentally deficient would argue otherwise. The electrical route is a circuitous one for obtaining heat. Besides, if electric heating became general, enormous plant would be required, the larger part of which would only be in use during the cold period of the year, and the waste through the capital charges would be costly. How the electricians ever hope to realize cheap general domestic heating by their methods is a puzzle. But singularly the hope persists; and it was fostered by the report of the Power Sub-Committee of the Coal Conservation Committee, to which we see, among others, the name of Prof. Bone is appended. While Prof. Bone is a whole-hearted believer in power being the province of electricity, we know full well from what he said in last week's Cantor Lecture that he does not believe, and on very good grounds indeed, that electricity is a fit, proper, and economical heating agent. Nevertheless, it is seen in the Power Sub-Committee's report, following vague calculations as to the coal and money economies that supposition says would result from the turning-over of power to electricity, that they refer to certain "additional and important "advantages." Among these are: "A possible saving in "coal consumption for domestic purposes; . . . the "reduction in the cost of coal handling involved in house-"to-house delivery and general coal distribution; and the "great advantages and economies which would result from "the more extended use of electricity in the household for "[mark this!] heating, cooking, and cleaning purposes in "the way of labour-saving devices, reduction of smoke, and "increased cleanliness." So we see that the Sub-Committee had in view the displacing by electricity of coal for domestic heating purposes, which Prof. Bone definitely points out is not an economical proposition. This displacement is therefore an integral part of the Committee's plans; it is the part that has made such a striking appeal to the imagination of popular writers in newspapers, who have caused some embarrassment to the electricity industry through their predictions that electricity is going to be retailed for domestic purposes at a farthing per unit! The beauty of it is that the public believes it; electricians do not.

However, it is the same Power Sub-Committee who foreshadowed these domestic "advantages," and computed some extraordinary coal and monetary savings by electricity taking over the power supply of the whole country, and whom Prof. Bone defends—in respect of power—in his lecture. Now Prof. Bone does not say that in all circumstances electricity should be used for power; nor does he express unqualified convictions on the subject of prime movers. He approaches the subject entirely from the point of view of an economist; and he finds fuel economy and economy to the power user in collective electrical provision. This is where power stands differently from other things which are of the nature of public utilities. Power has always been largely the subject of individualistic preference and custom. But we should be immensely sorry to see anything done that would stereotype the lines of power development, and rule-out all opportunity for development in other directions. Prof. Bone himself does not declare that the last word has been said in the development of the efficiency of the gas-engine; and as to the utilities of the gas-engine, the makers and the technical men of the gas industry who come in contact with practical work in factories can tell Prof. Bone of numberless places where there is an economy and power in the gas-engine which cannot be touched by the electric-motor of equal horse-power rating. The important thing, however, is that Prof. Bone finds valuable economies are to be derived from collective electrical generation and supply—collective generation into which every tributary of waste heat shall flow, and low-grade coals that are practically useless for any other purposes shall be utilized. And from this source of centrally generated power all power users should draw, or be left behind in the productive race. This is all very well; and the theory is most attractive. But the Power Sub-Committee's report does not tell us anything as to the costs of distributing this centrally derived electrical current. Nor does Prof. Bone. The North-East Coast is ground that is unmatchable for electrical opportunity—in the diversity of its sources of heat for generating purposes, the proximity of coal, the density of industrial custom, and so on. But we want to get much further afield than that—to the byways of industrial and agricultural life—to ascertain whether all that Prof. Bone says is acceptable for general application.

Where the report and its defender fail us, is in giving reliable information outside fuel and generating efficiencies, on which the saving of coal is compared with other methods of obtaining power. Transmission costs are not a negligible factor; and the electricity user has to pay them. The Niagara figures published in the "JOURNAL" for Jan. 14 (p. 67) showed that the cost of transmission ranged from 22 to 86 p.ct. of the total cost of the power, according to the distance and the amount of power transmitted; while the more extended figures from which those were taken disclosed that from (say) 60 to 70 p.ct. of the transmission costs represents capital charges. The doctrine of collective generation has to be considered in all its bearings; and, so considered, it is found that the question of massed industries and territorial limitations are significantly favourable points, which lose their power the further away we get and the more scattered the demand. Then, again, Mr. David Wilson, one of the Technical Advisers to the Coal Controller, has shown small stations working with efficiencies in the neighbourhood of 12 p.ct. ["JOURNAL," Feb. 11, p. 266], and distribution is circumscribed, so that the distribution expenses are not heavy. Assuming such stations are situated a distance from the "collective" power supply, is the saving of fuel going to compensate for the heavier transmission and general expenses? The gas industry suggests that much conveyance of coal can be saved by these small stations utilizing its coke, or by the combination of electrical generation with the gas-works, where there is an amount of waste heat in the spent charges which can be utilized. Prof. Bone talks about the burning of low-grade fuel at the generating stations. This might be profitable from the point of view of using something which is more or less a drug on the market, and much of which is now left in the

mines. A good efficiency may be shown on the calorific basis, but at the expense of boiler capacity, which means capital expenditure, additional wear and tear, and extra labour. Electrical engineers have made a great point of this while war conditions have been responsible for sending to their boilers fuel of a grade to which they have never been accustomed. If low-grade fuel, why not coke, which can be utilized with good efficiency if the rules laid down by Mr. E. W. L. Nicol, the Coke Expert of the London Coke Sales Committee, are complied with? Furthermore, private electrical plants are known—Mr. W. C. Mountain has quoted some ["Journal," Dec. 17 last, p. 613]—which will produce electrical energy at a cost with which even large stations cannot compete for energy delivered, unless the consumer is fortunate enough to be next door or almost so. Furthermore, we have the authority of Mr. T. M. Hunter, who is also an acknowledged expert on power questions—for saying that the cost of transmission of power by means of gas in mains, as compared with electric power, is both cheaper to instal and more economical to use.

Taking all these matters into account, it seems to us that, even after Prof. Bone's powerful defence as a scientist and fuel economist of the Power Sub-Committee's report and recommendations so far as they relate to power, the whole question of power supply has not yet been satisfactorily considered, and that it requires to be as thoroughly investigated by scientists and prominent men engaged in the supply and use of power agents—not only electrical—just as he suggested the previous week (with which suggestion we agree) that the technical affairs of the gas industry—including the standard of quality—need a very thorough exploration by a Committee of competent men.

Protecting the Secondary Products' Interests.

Every source of revenue of the gas industry has to be developed in the best possible manner. Critical sources, if they are not carefully handled, are coke and sulphate of ammonia. There should in future be no large shortage in the demand for coke if a clean coal is used so as to keep low the ash content, and everything possible done to reduce the moisture. For steam-raising, it should then have a very considerable market, although if the ambition of electrical people to be the universal power providers progressively materializes, there will be a progressive delimitation of the industrial market for coke, unless used for the generation of electricity. As to sulphate, there we have the new Selling Corporation which will receive large support from makers, providing certain difficulties and details can be safely negotiated, regarding which the Chairman (Mr. D. Milne Watson) and those working with him do not appear to be anxious as to success attending their efforts. We feel very confident that the commercial conditions confronting sulphate of ammonia are such that no endeavour should be missed to get the strongest possible organization of makers to deal with the position, and not leave it to the sole discretion and the unfettered action of the dealers and export merchants, to whom producers were very largely tied before the war.

At the meeting of sulphate of ammonia makers held in London last week at which the scheme was explained, Mr. F. C. O. Speyer made a remark which particularly strikes us. He said the scheme was in the nature of a declaration that British sulphate of ammonia makers intend in the future to have a voice in the marketing of their product, and in determining as to the destinations to which it should go. This observation and certain of the remarks which followed cause the question to rise to mind, If this unity of action among the manufacturers is good for sulphate of ammonia, why not for tar? Tar during the war has been materially enhanced in intrinsic value, and before the war was the subject of a price which was not anything like what should have been realized by producers. By the co-operation of groups of undertakings, there should in numerous cases be no difficulty in making more out of tar than can be realized from the distillers, the locality of whose plants often involves a long railway journey for the tar; and the prospect is that railway rates will increase, and make transport of the crude material still more commercially undesirable. There is also (the Sulphate of Ammonia Corporation have found) a difficulty in regard to the provision of capital. Municipal gas departments cannot subscribe capital to the Corporation; but they can become contractors. Statutory gas undertakings cannot directly provide capital for the purpose under their existing powers; but there are ways under consideration (as will be seen by the report in later columns) by which it is hoped to override this disability. As to co-operative tar distillation and dealings, we see no reason whatever why distilleries and trading should not be run by a separate local company, with capital subscribed by the shareholders in a group of companies. In these developing times for tar and its derivatives, this ought to be a very good investment.

Reverting to the question of sulphate of ammonia, there appear to be some makers who rather object to a standard quality, especially in regard to neutrality. Quality will be of essential importance in the times ahead; and the Corporation should not budge an iota from their decision in this respect. The best way to bring makers to their senses in this connection will be to leave them outside the Corporation. Quality will tell in the future. The time (we are safe in saying) will come when those who are unwilling to comply with the production of standard sulphate of ammonia will be forced by circumstances to become not only willing but anxious to comply. Anyway, the scheme should be given fair and full trial. Although the contract is to be for ten years, the individual maker will have the option of dissociating himself from the Corporation after the first two years; and if he does not exercise the option, he will continue in for another four years. This liberty will be a great inducement to test the efficacy of the Corporation. We are pleased to see the strong effort that is being made to advance and protect the interests of the gas industry in this critical part of its operations.

Lighting again to the Fore.

Lighting questions are again coming to the front; and the staffs of the outdoor departments of gas undertakings will have to be alive to see that the "fellow over the way" does not get in before them. Street lighting, shop lighting, factory lighting, and domestic lighting—in no single direction must there be neglect. The relative importance of these directions will depend upon the character of the area of supply. In street lighting, the "Safety First" Council have reported against having wide variations of illumination in the streets; and for outside shop window lighting, the glaring flickering lights that some vulgar fancies prefer, and which are an offence to good taste, they recommend shall be screened, so that comfort and safety in the streets shall not be abused. As to factory lighting, there should be a good deal of overhauling to be done, and new systems to instal, with the view of raising lighting efficiency. Manufacturers have been told, through reports by Government Departments, much about the importance in their reorganization schemes of good lighting in promoting the efficiency of the worker, and so increasing output, as well as preventing accidents. In innumerable cases, the savings to be effected by the most up-to-date gas-lighting systems will more than compensate for the installation, and the better lighting and all it promotes will be gains without additional expense. The electrical people will make very strong efforts with their gas-filled lamps—the lamps which now bid for custom under the misnomer of "half-watts"—but in cost high-pressure gas-lamps on one or other of the modern systems can beat these out-and-out. Besides, their high intrinsic brilliancy forbids any factory owner subjecting the eyesight of his employees to the direct influence of such lamps; and therefore they should be enclosed in some protecting globe, which reduces their efficiency, and adds to their installation expense. Renewals, too, are not a matter that can be ignored.

The subject of factory lighting re-opens, after some considerable rest, through the paper (published this week) which Mr. F. Pykett, of Halifax, read before the Yorkshire Junior Gas Association the other day. This is a description of a highly interesting installation of the duct system of high-pressure lighting in small units, and the interest is heightened by the fact that in the factory in question some of the floors are electrically lighted. The floors now lighted by high-pressure gas were formally less "illuminated," at a great expense for gas, and a much lower efficiency, by flat-flame burners. The duct system of high-pressure lighting is particularly suited to factories where fluff and dust flying in the air strenuously exercise themselves in making things uncomfortable for incandescent burners by accompanying the streams of primary and secondary air to the burners, with disastrous results to efficiency. In this system the supply of air is taken from the outside of the building; and, instead of each burner having its separate gas injector

and air intake, one injector is used to supply from three to seven burners. There were at first some minor difficulties with the installation. Experience teaches; and the maintenance costs in mantles, glass, &c., were last year notably low. The little table in the paper tells a tale of considerable savings in both mantles and glassware. When our electrical friends talk of the appalling failure of mantles in factories, the experience in this one can be brought out in refutation. There are mantles here which show a stability running over a whole season's lighting into the next. We undertake to say that the saving of 1834 c.ft. of gas per hour which has been effected by this installation more than pays its maintenance costs; and on top of this comes the improved lighting, which is as a summer's day compared with winter's gloom.

The Chief of the Halifax Corporation Gas Department (Mr. W. B. M'Lusky) was on safe ground when he told his visitors that, on the question of cost, "high-pressure gas "would beat electricity even if the super-power stations "realized all that was claimed for them." Some misinformed electrical people have been stating that the gas industry has abandoned the struggle for lighting as it has for power. The gas industry has abandoned neither the one nor the other. It is up to gas men to prove this by their successes—not omitting to remember that one of the essentials for lighting is constant gas in regard to composition, density, and pressure.

Methane Content of Gas.

There are many things about gas made and supplied which have not yet been satisfactorily determined. Last week we dealt with Prof. Bone's suggestion (which is much in line with what has been previously submitted in the "Journal") that a special scientific Committee should be appointed to investigate various problems, and upon which Committee there should also be representatives of the business element. It is clear there is an abundance of work that such a Committee could and should take up, so long as it is not made a reason for delaying the industry making use of economies which are so necessary to help it to retrieve some of the financial stability of which it has been deprived. The second Cantor Lecture published in our issue of last week itself indicated several matters into which such a Committee could inquire. One is the determination of the precise importance of methane in gas, and whether or not a minimum should be established. The matter is one which is not, so far as we know, at present receiving deliberate attention, though it is obvious Prof. Bone has it well in mind. There are, of course, many properties about methane which make it a most desirable constituent of gas—one being its (with air) low rate of explosibility, to which Prof. Bone directed consideration in the second lecture. Agreeing that some methane in gas is an advantage, the next question is, What percentage would represent a minimum that could be adopted without depriving the gas of the economies of manufacture which are so desirable both in the interests of the industry and in those of coal economy?

In pre-war times gas always contained a fairly large percentage of methane—in some cases, upwards of 30 p.ct. But present practices have brought down the percentage; and experiences suggest that the gas that has been supplied during the war contains a sufficiency. But there are the proposals for going beyond what has been done during the war; and what is wanted is to assure the safety of the ground upon which future movements are made. In the second lecture, Prof. Bone gave the analysis of a mixed gas, produced by carbonizing 1 ton of coal and gasifying the coke —the product being composed of approximately 13,000 c.ft. of coal gas, and 37,000 c.ft. of water gas, or a total of about 50,000 c.ft. In the analysis of this mixed gas, it is seen there is 7 p.ct. of methane. Is this a percentage that is too low for gas distributed for public use? The lecturer did not inform us; and without actual experimental investigation, we doubt whether he would be prepared to answer categorically. But from what he remarked later, it may be assumed that he would have serious doubts on the subject, if he were asked to express an opinion without experiment. Assuming the result of investigation was against such a low percentage of methane in distributed gas, it would not dispose of the proposal to completely gasify coal in gas-works, seeing that the water gas could be carburetted to give a certain minimum of methane and other hydrocarbon contents to the gas.

If we turn to Prof. Bone's book, "Coal and its Scientific "Uses," we see that [pp. 384-5] the 750 B.Th.U. gas (gross) that was formerly being supplied in New York City, and apparently some 86 p.ct. of which was carburetted water gas, contained 19·3 p.ct. of methane. This falls much below what before the war was very generally the percentage in this country, and which was, experience suggests, unnecessarily high. The 19·3 p.ct. brings us back to the second Cantor Lecture; and there is seen an analysis of gas produced by steaming vertical retort charges. In this case 16,600 c.ft. of gas were made; and the methane is 20 p.ct., which is slightly better than the heavily carburetted gas of New York. This is interesting, because it shows that steaming of charges is something that can be carried out, and yet satisfy the most critical in the matter of methane content. What it would now be interesting to establish is how far scientific investigation would sanction any descent towards the 7 p.ct. of methane realized in complete gasification as described, in order to maintain the suitability of a gas for public supply. It is noticed that the carbon monoxide in the gas resulting from complete gasification is 35 p.ct.; New York appears to have no objection to 27 p.ct.; and in the analysis of the gas from the steamed charges of vertical retorts the percentage is 17·1.

Capital Issues and Industrial Requirements.

The agitation against the last issued regulations regarding capital issues has been successful. Mr. Chamberlain announced in the House last week that, after consulting his City and Treasury advisers, he was no longer justified in attempting to maintain control over the distribution of capital for domestic purposes. The Treasury have since given notice of a general license for issues of capital by companies resident and carrying on business in the United Kingdom, for capital purposes within the United Kingdom, provided that, in every prospectus offering to the public for subscription or purchase any issue made under such general license, a statement is included that "no part of the proceeds of the issue is to be applied for capital purposes outside the United Kingdom or to replace money which has been so applied." Everybody knows that industrial revival and expansion is the great need of to-day. This cannot take place without capital; but the Government have hitherto kept a heavy barrier across the road against industry.

The Coal Position.

We are not out of the wood yet in connection with the coa miners' demands. The country has with this and other labour troubles—railway and transport—been on the brink of a catastrophe; and the whole country knows it. Fortunately we can breathe more freely now, though aware that all danger is not behind us. There is still a critical time to be faced; and while we look hopefully to a safe passing, it is as well to do so with some amount of caution. The recommendations (which were adopted by the Government) of Mr. Justice Sankey and three members of the Coal Commission were not accepted immediately by the members of the Executive of the Coal Miners' Federation; and there was a long discussion with Mr. Bonar Law, who made it clear that the Government could not depart from the deliberate decision of the only impartial members of the tribunal to whom the claims of the miners had been submitted for adjudication. The Executive, recognizing how much of the programme of the Federation had been gained, and what promise there was in the report of practically an eventual fulfilment of their demands, decided to recommend the delegates from the various coal areas to accept the terms. Then came a very critical tussle; and the country soon became aware of two widely divided and opposing elements among the men's representatives. Wisdom ultimately gained the day over the ultraists, who still wanted an immediate compliance with their full demands. In other words, they wished to assume the autocratic power of vetoing the decisions of elected government, and defining precisely what should be done. Government cannot proceed in this fashion. We are a nation; and as a nation we must be governed on a collective basis, and not by a trade confederacy. However, the upshot was agreement to recommend the miners to accept the Government adopted report, and to take a ballot of the whole of the miners, the result of which, and the final decision on which, may be expected about the middle of this month. That is where things are still critical. There has been considerable kicking

over the traces in some coal areas—in South Wales, Derbyshire, North Staffordshire, the Black Country, and Nottinghamshire. In fact, it was computed that on Thursday there were no less than 125,000 miners idle. Towards the end of the week, some were returning; and the leaders of the Federation were then trying to get them all to do so. The parts of the country depending on these collieries have been put, owing to the shortness of stocks, into a worse position; in fact, the situation from more than one centre was reported on Saturday to be fast becoming desperate. Later reports say the good counsels are succeeding. We hope this is true.

Salaries of Gas Officials.

"Anonymous," whose letter on this subject appeared in the "Journal" last week, will have found his letter deliveries supplemented by communications which have been forwarded to us for transmission to him. We have also had separate communications; and these show that the dissatisfaction over the pay of many technical gas officials is widespread, and that the consideration extended to them falls very far short of that received by the rank-and-file. In some cases, there has been no recognition of their right (occupying as they do positions which demand higher qualification and entail large responsibility) to augmented pay for their heavier work and the increased cost of living. In these cases, administrators have taken advantage of the present powerlessness of their officials to enforce their righteous claim. We repeat that those officials who are paid justly according to their deserts should do their part in helping to right this wrong; and the best way to do this would be by combination as suggested last week by "Anonymous."

A Strong Move Necessary.

This is an old subject, but never more important than it has become the last two or three years. The present conditions, for the sake of the future of the profession, must not be allowed to continue. In the communications we have received, a good deal of sympathy has been expressed with the proposal of "Anonymous" to organize, and with the comments made in our editorial columns last week. We are reminded of the meetings that have been held on this very subject, and of the schemes brought forward at the meetings. One of the schemes is described as having been weak; and something much stronger is necessary. A considerable amount of information has since been collected on the subject, including particulars of the Electrical Power Engineers' Association, which is an organization having like authority to that which "Anonymous" is anxious to see conferred upon a similar organization of technical officials in the gas industry. The matter must be pushed with all the energy possible, as a Registered Society of Technical Gas Officials is long overdue and badly wanted. In our opinion, it is now or never. The status and remuneration of the technical workers of the industry must be raised from the bottom upwards, so as to keep and attract brains, capacity, and efficiency. The places where pay and position are what they should be are not sufficient for ensuring throughout the profession "maintenance, repair, and renewals" on a scale of quality which the current and future interests of the gas industry so strongly demand.

Injustice and Super-Difficulties at Buenos Aires.

It is more than high time that the Buenos Aires authorities left the course of injustice that they have been pursuing towards the Primitiva Gas Company. When they look at the present condition of the Company, and remember that the terms upon which the undertaking is working were based on pre-war conditions, they must recognize that justice demands a reversal of their action. They do not do anything substantial towards liquidating their debt; and they are sticking fast to a legal right as to the price of gas, when everything—including an Arbitrator's award—tells them that the legal right has been made morally wrong by a condition of things brought about by the war. Is it right that a Company should be losing 7¼d. per 1000 c.ft. of gas made? It is impossible for any concern to go on indefinitely on such lines. It must inevitably lead to liquidation, notwithstanding that the value of the plant as it exists to-day may be between 100 and 200 p.ct. more than its original cost. It was a story bordering on the romantic that the Chairman (Mr. A. E. Bowen) had to tell the shareholders last Tuesday; and it will be found reported in this issue. The professional colleagues of the General Manager (Mr. W. Angus) will whole-heartedly sympathize with him. They have had their difficulties, but none such as those he has had. Difficulties have their degrees; and when gas engineers on this side read that Mr. Angus had only 11,731 tons of coal to use last year, and so had to carbonize 107,730 tons of timber, 26,758 tons of cereals, 3368 tons of bones, and 3325 tons of water gas oil and petroleum, they will have facts there which tell them of tremendous struggles and anxieties. Coal cost the Company £7 10s. 6d. per ton last year. Everybody will wish the Chairman success in his mission to Buenos Aires, on which he started last Saturday. There are two things he particularly wishes to accomplish: One is to get the right to charge for gas on a sliding-scale based on the price of coal; the other is to secure an immediate settlement of the Municipality's heavy debt to the Company.

Sliding-Scale Gas Prices Based on Cost of Coal.

The suggestion in the foregoing paragraph that the revision of the price of gas should be on a sliding-scale based on the price of coal is one which, under the new order of things in regard to costs, will again come to the fore, though coal, as we only too well know to-day, is not by any means the only factor which influences production costs of gas. Finance, labour, materials, and goods of all descriptions weigh heavily in the balance. There are only two or three precedents in this country for anything of the kind—one was the temporary case of the Alliance and Dublin Consumers' Gas Company. The Staffordshire Mond Gas Act of 1901 included the power to vary the prescribed rate for the gas according to the price of slack; but in the session of 1917 the Company obtained agreement to their request that the basis of variations in the price of gas should be the "cost of production," which would bring into account all the factors. In the Garw and Ogmore Gas Company's Provisional Order promoted last year, there was a clause providing for the standard price varying according to the price of coal. The intentions were that in any half year when the average price of coal delivered on to the Company's sidings did not exceed 15s., the standard price should be 4s. 6d. per 1000 c.ft.; and that the standard price should be raised 6d. per 1000 c.ft. in respect of every 2s., or any part thereof, by which the price per ton of coal exceeded 15s. These and other matters were discussed in an editorial article in the "Journal" for Jan. 29, 1918 [p. 191]. We are reminded of the article by the Primitiva proposal, and by a suggestion made by Mr. Charles Carpenter, D.Sc., that the standard price of gas, instead of being fixed as now, should be a variable one, by making it dependent on the price of coal. This was in connection with his article in the "Gas World" on charging for gas on a calorific basis—making the standard unit 100,000 B.Th.U. His suggestion is a considerable variation from the Garw proposal. Expressed in a few lines, it is this: "Suppose the gas standard price by which dividends are regulated is 9½d. per 100,000 B.Th.U., and that the cost of Durham coal is 23s. 6d. per ton f.o.b., for every increase in price of 1s. 6d. per ton, the basic price of gas would be increased by ¼d. per unit, while it would fall by the same amount for each reduction of 1s. 6d. in the cost of coal." If anything is done in this direction, we hope the coal will be of a cleaner character than it has been during the war.

Evening Star Lodge—No. 1719.

The Installation Meeting of the Lodge was held at the Freemasons Hall, Great Queen Street, on Wednesday last, when the retiring Master, W. Bro. Fred J. West, P.M. 3053, vacated the chair in favour of W. Bro. H. W. Packman, P.P.G.J.D. Surrey. A feature of the evening was the presentation of a banner by the I.P.M. to commemorate his year of office; and, in recognition of his work for the Lodge, a past-master jewel was presented to him in the name of the brethren. The list of officers for the ensuing year is as follows:

W. Bro. H. W. Packham, P.P.G.J.D. Surrey	W.M.
W. Bro. Frederick J. West, P.M. 3053	I.P.M.
Bro. Corbett W. Woodall	S.W.
Bro. Alfred C. Beal	J.W.
W. Bro. A. E. Broadberry, P.M., L.R.	Chaplain
W. Bro. Walter T. Dunn, P.M., L.R.	Treasurer
W. Bro. Arthur Valon, P.M., L.R.	Secretary
W. Bro. Charles Clare	S.D.
W. Bro. R. W. Foster, L.R.	J.D.
W. Bro. Archibald P. Main	Dir. of Ceremonies
Bro. John F. Simmance	Organist
Bro. Frank Jervis	I.G.
Bro. Frank West, Bro. Rae P. Normand, Bro. G. D. Bidwell	Stewards

PERSONAL.

Mr. J. M'NICHOLL, the Gas Manager to the Mossley Corporation, has been appointed to a similar post with the Cork Gas Consumers' Company.

Mr. L. R. HISLOP, Gas Manager at Tayport, has been appointed Chief Assistant at the Dundee Gas-Works. The salary is £300 per annum.

Mr. WALTER FROST has been appointed Engineer and Manager to the Middlewich Gas Company, to succeed Mr. R. WEST, who is retiring in consequence of failing health.

Mr. MAURICE DROHAN, of the Dungarvan Gas-Works, has been appointed Manager of the Kilkenny Gas-Works; and Mr. DENIS DROHAN is to be Manager of the Lismore Gas-Works.

The Town Council of the county borough of Stoke-on-Trent, at their meeting last Thursday, unanimously accepted the recommendation of the Gas Committee to increase the salary of their Chief Engineer and General Manager, Mr. ALEX. MACKAY, by £200 per annum.

Mr. JOHN F. SKEA, an Assistant to Mr. Alexander Yuill at the Dundee Gas-Works, has been appointed Manager to the Jedburgh Gas Company. He is a son of Mr. John Skea, late Gas Manager at Kinross, and served a period with his father, and then at Lochgelly as Assistant under Mr. Ewing and Mr. James D. Keillor. In 1911, he transferred to Broughty Ferry, under Mr. George Keillor, and then under Mr. Yuill, when Broughty Ferry was annexed to Dundee. Mr. Skea, who served in the Black Watch and gained the Military Medal and Bar, was demobilized a few weeks ago.

At the Bradford Corporation Gas Department show-rooms, in Darley Street, last Wednesday evening, there was a large gathering of those engaged in the various branches of the gas undertaking, to extend good wishes to Mr. H. W. WILLMER, the Deputy Superintendent of the showrooms, who has taken up his new post at Bath. Mr. Charles Wood (the Chief Engineer) was absent in London, and Mr. E. J. Sutcliffe (the Deputy Engineer) was only able to make a brief stay. The chair, therefore, was occupied by Mr. A. W. Butterfield, of the stove department workshops, who presented to Mr. Willmer, on behalf of his colleagues, a handsome suit case, despatch case, and silver-mounted walking stick.

OBITUARY.

ANDREW DOUGALL.

THERE will be a widespread feeling of sorrow at the news of the death of Mr. Andrew Dougall, which occurred somewhat unexpectedly, after a few hours' illness, last Wednesday evening, at his residence in Mount Ephraim Road, Tunbridge Wells.

Mr. Dougall, who was in his 62nd year, had been in failing health for some time. Indeed, it was for this reason that he retired some two years ago from his position with the Tunbridge Wells Gas Company, to whose undertaking he had been Engineer for 36 years, and for part of the time General Manager also. The Company's business prospered exceedingly under his care; and numerous other concerns were indebted to him for advice tendered in a consultative capacity. He was also Chairman of the Crowborough Gas Company. Apart from these professional activities, he took great interest in the organizations representative of the members of the gas industry. He was the first President of the united Institution in 1902-3, preceding which he had taken a very prominent part in the work of bringing about unity in the gas industry, and in that of arranging the new Constitution and Articles of Association. Mr. Dougall's tenancy of the presidential chair was largely due to the circumstance that he was the Senior Vice-President of the old Institute; and so his presidency on this occasion, as a matter of fact, continued without a break the line of presidential representation from the time of the old British Association of Gas Managers. Up to the time of his death, he was one of the Hon. Auditors of the Southern Association of Gas Engineers and Managers; and he will everywhere be missed. He was a member of the Institution of Civil Engineers.

Mr. Dougall, who was a native of Paisley, leaves a widow and two daughters, with whom much sympathy will be felt in their bereavement. His only son was killed in the war, and received the posthumous award of the Victoria Cross. The funeral was arranged to take place with a memorial service at Mount Pleasant Church, where Mr. Dougall was for many years an active worker.

An Appreciation by Mr. D. T. Livesey.

I first met Mr. Andrew Dougall in 1879, when he was appointed to his first charge at the Radcliffe and Pilkington Gas-Works, near Manchester. My uncles (with whom I had my early training) had had charge of these works for many years. To myself, Mr. Dougall's advent had some elements of disappointment in it, to which I gave expression, as we were introduced to each other. I look back to-day, through the forty intervening years; and I can still recall the calm, quiet, steady, unperturbed expression which greeted my outburst, as he replied: "That need not interfere with our working amicably together;" and from that very moment commenced a friendship which has never faltered.

During the short period he remained at Radcliffe, our relations were of the most cordial and pleasurable nature; and when he left in 1881 to take up the position of Manager at the then "model" gas-works of Tunbridge Wells, I felt I was losing a close and valued friend. His was, however, no friendship of the "out of sight out of mind" character. After his removal from the district, he was repeatedly showing his interest in my welfare; and no occasion was allowed to pass in which he could "lend a helping hand," without it being utilized. And so it came about that I soon followed him to the South of England.

It has been my lot to be more or less closely in touch with him throughout the intervening years. I have met Mr. Dougall under all kinds of circumstances, but always found him the same sane, steady, courteous nature, ever-ready to give any assistance in his power to anyone within the orbit of his influence. This was illustrated on one occasion when, cycling into the country, I dropped down at a village gas-works, to satisfy a gas manager's common desire to see the works. In the course of conversation with the working manager, Mr. Dougall's name was casually mentioned; and I well remember the immediate effect, which was as if a gleam of sunshine passed over the features of the man. His face broadened out into the most pleasant of smiles as he replied: "Ah! he put me into my position here." Nothing seemed to give Mr. Dougall so much pleasure as helping forward another up the steps of life. There are not a few who owe much to this spirit of eager helpfulness, which was so characteristic of his nature. On the other hand, nothing distressed him more than to find one of his protégés failing to fulfil his hopes and doing credit to his training. While he was thus ever ready to help others, he had that true element of greatness which could accept a suggestion from the most menial workman serving under him. He had a wonderful way of managing men, and binding them to himself. Even a reproof would be administered with such genial good humour that it left no ascerbity behind, though it went straight to its mark. Others may better describe his work in the gas profession, as he was very well known among leaders of the industry. His work at Tunbridge Wells, where he spent some thirty-six years, speaks for itself.

I have always felt—knowing, as I did, the very great interest he manifested in the amalgamation of the Gas Institute and the Institution of Gas Engineers—that he never received full credit for the amount of effort he put forth when Hon. Secretary of the Institute, for his share in bringing about the amalgamation of the two bodies into the one solid Society. Probably no individual person did more for the accomplishment of this purpose. I well remember his keen disappointment when what some of us thought were grave indiscretions were manifest at the annual meeting of the Institute in 1900. It seemed for a time as if the high hopes entertained by the best minds in the industry were to be blighted, and the much desired union indefinitely postponed. He was unremitting in his efforts to avoid such an issue. His election as the first President of the united forces of the industry in the Institution of Gas Engineers for 1903 was no more than his due. How far his presidential address on that occasion has influenced the conduct of the Institution and the industry, it would be difficult to say; but, by a consensus of opinion at the time, it was suited to the historic occasion on which it was spoken.

But now the Standard Bearer has passed onward. Physical infirmities called him to yield up his trust at a comparatively early age; and his quiet smile and pleasant healthy humour will greet us no more. Of all the men I have ever met, none so completely fulfilled Antony's description of Brutus:

> "His life was gentle; and the elements
> So mixed in him, that Nature might stand up,
> And say to all the world, 'This was a man.'"

One naturally draws the veil over domestic life; but I may lift it so far as to say that in this he was particularly happy. The same genial urbanity and quiet good humour which characterized his outward life, was the atmosphere of his home life. The recent loss of his only son in the war—after gallant deeds which earned the M.C. and the V.C., whom a fellow officer designated, "the bravest man he ever knew—was naturally a heavy blow to Mr. Dougall and his family. And now he himself is taken away, the sincere sympathy of all who came in contact with him will go out to the bereaved wife and two daughters in their present sore loss. Many like myself will feel the sentiment of Hamlet for his father, applicable to Mr. Dougall.

> "He was a man, take him for all in all,
> I shall not look upon his like again."

The death has taken place, at the age of 81 years, of Mr. WILLIAM KNEESHAW, who was Manager of the Clonmel Gas-Works until his retirement seven years ago, when he was succeeded by his son, Mr. Richard Kneeshaw. He ably filled the office of Manager for a period of forty years. The British Gaslight Company was started in Clonmel in 1824. In 1842 new works were built by Mr. Kneeshaw's father (who went to Clonmel from Sheffield), for the Clonmel gas consumers. In 1860, the two Companies amalgamated; and the undertaking then formed was taken over by the Clonmel Corporation in 1896. Thus, reckoning the services of Mr. Richard Kneeshaw, the family have been responsible for the supply of gas to Clonmel for eighty years without a break. Deceased was the father of ten sons—eight of whom survive him—and nine daughters. He was of a quiet and unassuming disposition, and was remarkable for his devoted attention to his business.

STEAMING HORIZONTAL & INCLINED RETORTS OR "CONSTRUCTIVE DISTILLATION."

By H. J. Toogood, of Elland.

Several methods are in vogue for steaming horizontal retorts, having in view the direct benefit only of the simple addition of the water gas (so generated) to the coal-gas yield. This article attempts to briefly show how both the direct and indirect benefits may be coupled with the practice of existing horizontal retorts.

Considering the present practice of horizontal retorting, the two outstanding characteristics are :

1. The large volume of water-vapour laden coal gas evolved during the early period of a charge, with the consequent reduction of the retort temperature, and the deposit of tar on the interior of the ascension pipes.
2. The small volume of exceedingly hot gas given off towards the end of the period, causing scurf, impoverished yields, and the hardening of the aforesaid tar in the ascension pipes.

First Period—Drying Coal; Two Hours.

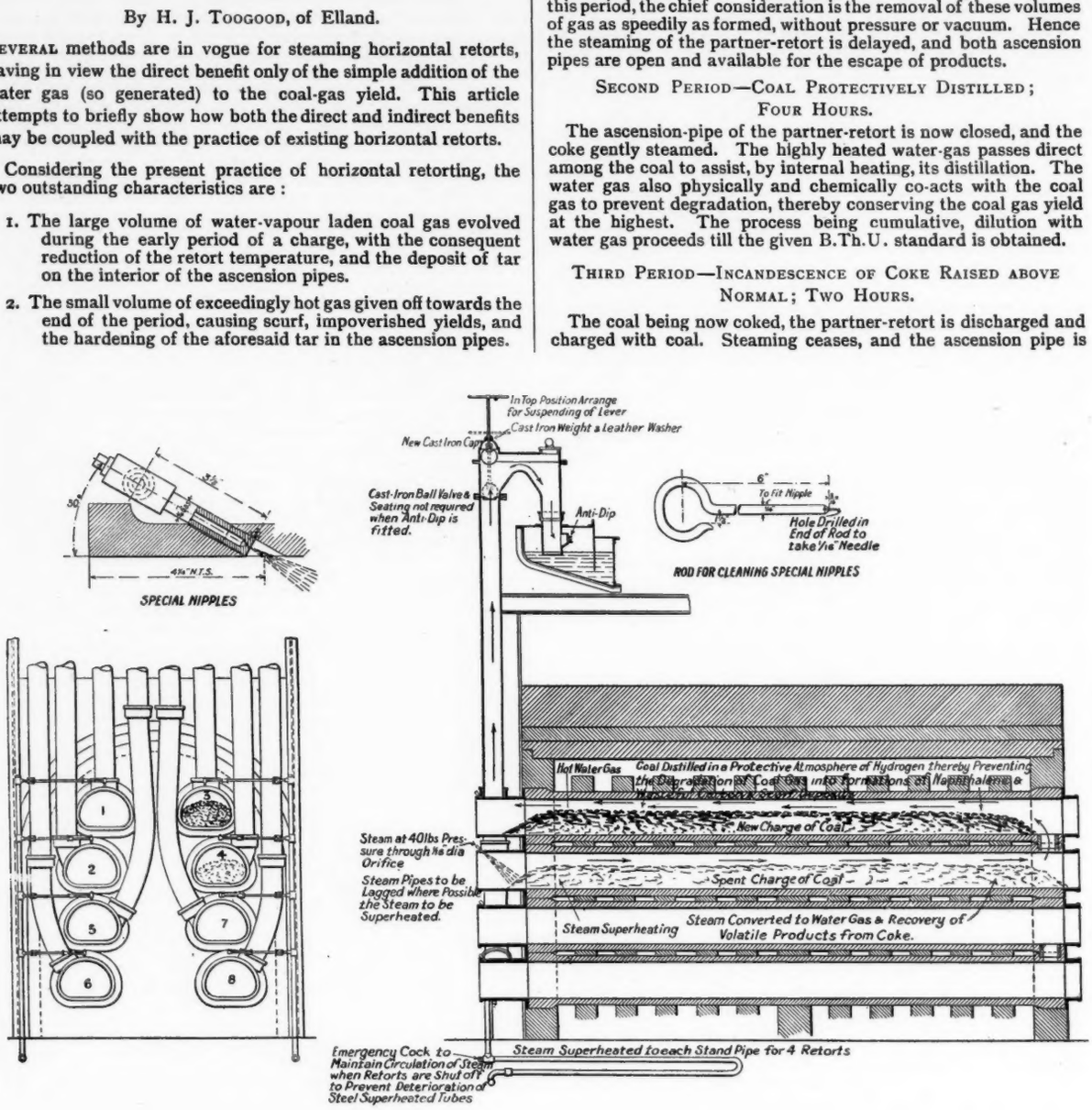
On charging, the coal coming in contact with the hot walls gives rise to the evolution of large volumes of low-temperature coal gas, highly saturated and protected with water vapour. During this period, the chief consideration is the removal of these volumes of gas as speedily as formed, without pressure or vacuum. Hence the steaming of the partner-retort is delayed, and both ascension pipes are open and available for the escape of products.

Second Period—Coal Protectively Distilled; Four Hours.

The ascension-pipe of the partner-retort is now closed, and the coke gently steamed. The highly heated water-gas passes direct among the coal to assist, by internal heating, its distillation. The water gas also physically and chemically co-acts with the coal gas to prevent degradation, thereby conserving the coal gas yield at the highest. The process being cumulative, dilution with water gas proceeds till the given B.Th.U. standard is obtained.

Third Period—Incandescence of Coke Raised above Normal; Two Hours.

The coal being now coked, the partner-retort is discharged and charged with coal. Steaming ceases, and the ascension pipe is


In Top Position Arrange for Suspending of Lever
Cast Iron Weight & Leather Washer
New Cast Iron Cap
Cast-Iron Ball Valve & Seating not required when Anti-Dip is fitted.
Anti-Dip
To Fit Nipple
Hole Drilled in End of Rod to take 1/16" Needle
ROD FOR CLEANING SPECIAL NIPPLES
SPECIAL NIPPLES
Hot Water Gas
Coal Distilled in a Protective Atmosphere of Hydrogen thereby Preventing the Degradation of Coal Gas into Formations of Naphthalene &
New Charge of Coal
Steam at 40lbs Pressure through 1/8" dia Orifice
Steam Pipes to be Lagged where Possible the Steam to be Superheated.
Spent Charge of Coal
Steam Superheating
Steam Converted to Water Gas & Recovery of Volatile Products from Coke.
Emergency Cock to Maintain Circulation of Steam when Retorts are Shut off to Prevent Deterioration of Steel Superheated Tubes
Steam Superheated to each Stand Pipe for 4 Retorts
1
2
3
4
5
6
7
8

Time.	Shut Steam; Open Ascension Pipe; Charge Retort.	Close Ascension Pipe; Commence Steaming.
6 o'clock	1 & 3	—
8 ,,	5 & 7	2 & 4
10 ,,	—	6 & 8
12 ,,	2 & 4	—
2 ,,	6 & 8	1 & 3
4 ,,	—	5 & 7

Time.	Drying Period.
Two Hours	Rush of Moisture-Laden Coal Gas from Both Ends of Retort.
Four ,,	Coal Gas Protectively Distilled.
Two ,,	Coke Soaked in Heat to Raise Incandescence.
Four ,,	Steaming Coke for Water Gas Manufacture and Release of Imprisoned Volatiles.

"CONSTRUCTIVE DISTILLATION" APPLIED TO HORIZONTAL RETORTS.—Patent No. 11,610 of 1918.

It is desired to modify these adverse features in conjunction with continuous steaming. Briefly, the proposal consists in :

(*a*) Connecting retorts in widely differing stages of carbonization to work in series.

(*b*) Providing seals or valves in the ascension pipes to control the evolved gases.

(*c*) Furnishing the mouthpieces with a steam jet.

(*d*) Timing the process to construct the conditions required to produce the desired yields.

The illustration sets forth the arrangement. It is to be observed that there are no valves in the necessarily severe position between the retorts, and also it is assumed that heavy charges, good heats, and superheated steam are in use.

opened. The new coke is allowed to saturate in heat, whereby its average temperature is raised above normal, preparatory to steaming.

Fourth Period—Steaming the Spent Charge of Coke; Four Hours.

The ascension pipe is closed and the now brightly incandescent coke is steamed for the release of the last traces of volatiles, and the maintenance of the water-gas atmosphere in the neighbouring retort.

Thus with one heating of the raw material coal, and with the minimum of effort, and from existing plants, all coal is protectively distilled, and all coke is scavenged for the release of imprisoned volatiles, whereby the gas and liquid yields are increased, coal is conserved, and as a consequence the arduous retort-house labour is reduced.

FINANCIAL AID FOR FRENCH GAS UNDERTAKINGS

The hardships inflicted by the war—particularly upon the smaller gas undertakings in France—and the necessity for reconstruction and extension which faces many of those of limited resources, have led to the formation of a financial organization for the purpose of assisting such companies in surmounting the difficulties which the next few years will have for them.

L'Union Gazière de Crédit, as it is to be called, is a Company of 5,000,000 frs., divided into 10,000 shares of 500 frs. each. Among the first subscribers are the Société Lyonnaise des Eaux et de l'Eclairage, the Compagnie Générale du Gaz pour la France et l'Etranger, the Compagnie Centrale d'Eclairage et de Chauffage par le Gaz et l'Electricité (Lebon et Cie.). the Compagnie du Gaz de Lyon, the Groupe Théodore Vautier, the Compagnie Général Française et Continentale d'Eclairage, the Société Gaz et Eaux, the Compagnie Continentale du Gaz, the Groupe Lachomette, Villiers et Cie., the Groupe Piaton, the Gaz Franco-Belge, the Société des Usines à Gaz du Nord et de l'Est, the Société Industrielle du Gaz et de l'Electricité (M. Paul Mallet), the Société Anonyme des Hauts Fourneaux et Fonderies de Pont-à-Mousson, the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, and the Compagnie Continentale pour la Fabrication des Compteurs à Gaz et Autres Appareils. The Board of Directors consists of MM. Albert Petsche, Robert Ellissen, Alfred Lebon, Louis Desanges, Paul Munich, A. Boutan-Delebecque, R. Lesage, Sabatié Garat, Georges Vautier, and Henri Villiers.

The operations of the Union are, in the first place, to include action in an advisory capacity, in collaboration with a consulting engineer and the technical staff of the groups in its membership, in regard to schemes of reconstruction and extension of works. It will make advances of money for the commencement of new programmes, and generally provide credit for plant and concessions permitting of the reconstruction or extension of gas companies. A large measure of such help is recognized as a very present necessity for undertakings in the northern and eastern districts which have suffered from enemy invasion. It is the declared policy of the Union to preserve its freedom of action in its relation with financial houses and makers of works plant, as a means of profiting from favourable conditions of the market. Offices have been provisionally obtained at No. 8, Avenue Percier, Paris; but for the present correspondence is to be addressed to the President, Union Gazière de Crédit, No. 73, Boulevard Haussmann, Paris.

ELECTRICITY SUPPLY MEMORANDA.

The men of the electricity industry who are not in industrial areas will look with great displeasure on the proposals that are now under consideration in the gas industry to trade more on the thermal value of gas than upon volume. The relative position of the two industries in respect of thermal efficiency and value was shown so conclusively, and in a manner that has received a large amount of publicity in the Daily Press, through the paper read before the Royal Society of Arts last Wednesday week by Sir Dugald Clerk, that the electrical experts will have some considerable difficulty in effectively applying camouflage to what was then disclosed. The thermal efficiency of electrical generating stations is notoriously bad; the best that the much-vaunted super-stations, with the most efficient turbines, will be able to accomplish discloses what Lord Moulton has so aptly described as a "ghastly waste" of the heat energy of the fuel used when the electric current is applied to heating purposes. Supposing that the carbonization of coal preceded the production of electrical energy, the case is proved up to the hilt that far better would it be, for heating purposes, to utilize the gas and the coke direct than to employ them for developing electrical energy (other than for uses in which a high concentrated temperature is needed) to be afterwards turned back to heat. All this juggling with heat energy for the purpose of transmitting (say) a tithe of the energy of the coal along a cable or wire is not justified; and the efficiency of electrical appliances does not afford any compensation. The "ghastly" loss is at the very root of operations. Moreover, from the capital point of view, the idea of the electrical industry becoming general purveyors of an agent for domestic heating is a piece of mental aberration which requires nothing more to dispose of it than to calculate the immense quantity of coal that would be required to develop the electricity, the enormous capital that would be needed for electrical plant sufficient to meet the peak load, and the fearful waste of capital there would be by the plant remaining idle through all those months of the year when but little domestic heating is called for. Those of our electrical friends who did not see Sir Dugald Clerk's paper will find it in the "Journal" last week. No one will begrudge the electrical industry the right to the claim made by Colonel Crompton, after Sir Dugald had read his paper, that portable electric-heaters are useful for aged people and invalids who want a source of warmth brought close to their epidermis.

The Sad Case for Electric Heating.

Selling B.Th.U.

Of the coal employed in producing gas, coke, tar, sulphate of ammonia, and sulphur, only a few hundredweights of its substance per ton are turned into gas; the whole is not destroyed as is done in the raising of steam. But taking the gas alone, the B.Th.U.'s that are produced for sale are of a magnificent order compared with electricity that gives no coke, tar, ammonia, sulphur, or anything else for sale. The most ordinary working supplies 6¼ million B.Th.U. in the form of gas; and gas manufacturing developments are now giving anything between that figure and 10 million B.Th.U. per ton of coal. This is not a cheerful reflection for electricians; and less still would be competition by the charging for gas on the heat energy basis. This is not a new idea; but, as was seen on p. 565 of the "Journal" for March 18, Mr. Charles Carpenter, D.Sc., has proposed a plan on which gas could be sold on the potential heat basis instead of by volume. Doing this, and showing the country the luxurious quantity of B.Th.U.'s that can be obtained by gas as compared with electricity, would not only be in the householders' interests but in the national interests, as it would help to make for national efficiency. Let us examine the matter by taking gas of 500 B.Th.U. per cubic foot, and, under the plan that is proposed by the Chairman of the South Metropolitan Gas Company, the suggested standard unit of 100,000 B.Th.U. With gas sold at 2s. 6d. per 1000 c.ft., the cost per unit of 100,000 B.Th.U., would be 6d.; and electricity would have to be sold at 0·2d. per Board of Trade unit (3420 B.Th.U.) to put into the hands of the consumer an equal number of B.Th.U. [100,000 ÷ 3420 = (say) 30; and 0·2d. × 30 = 6d.] With gas sold at 3s. per 1000 c.ft., the cost per unit of 100,000 B.Th.U. would be 7·2d.; and electricity would have to be sold at 0·24d. per Board of Trade unit to compete on equal terms. With gas sold at 3s. 6d. per 1000 c.ft., the cost per unit of 100,000 B.Th.U. would be 8·4d.; and electricity would have to be sold at 0·28d. per Board of Trade unit to compete. With gas at 4s. per 1000 c.ft., the cost per unit of 100,000 B.Th.U. would be 9·6d., and electricity would have to be sold at 0·32d. per Board of Trade unit to compete. With gas at 4s. 6d. per 1000 c.ft., the cost per unit of 100,000 B.Th.U. would be 10·8d., and electricity would have to be sold at 0·36d. per Board of Trade unit to compete. Selling gas on the basis of its certified heat energy would enable the gas industry to show the consumer precisely the difference in cost between it and electricity. For example, as 30 units of electricity would be required to give to the consumer the equivalent of the gas unit (100,000 B.Th.U.), this means that 2s. 6d. would have to be paid for the current at 1d. per unit; or at 6d. per gas unit, 16,666 B.Th.U. would be supplied for 1d., compared with only 3420 by electrical means. This is what electricity purveyors are up-against when considering the electric heating proposition for dwelling-houses; and we do not think they will altogether relish the outlook.

Position of the Schemes and Coal and Electricity Transmission.

The electrical people cannot escape from the notion that the Ways and Communications Bill (if passed into law as it now stands) will cause electricity to become subordinate to railways and other forms of traction; and by no twist of their imaginations can they be brought to see that there is any good foundation for the genial optimism of Sir Eric Geddes that the actual result will be that the advantages will be reciprocal—that while electricity will serve the railways and other means of transport, these will return the compliment by developing the opportunities for electricity. This is an attractive anticipation; but the electrical industry are still unsuccessfully spying about for rays of justification. The Chairman of the County of London Electric Supply Company is Mr. J. B. Braithwaite; and he is a bit sarcastic over the whole proceeding. He thinks the Ways and Communications Bill should be called "a Bill for paralyzing private enterprise and business generally." We hope industrial paralysis is not part of the policy of the new Parliament. The gas industry had a bad taste of it in the old Parliament; and certainly things up to the present are a bit suspicious in the new. But the new Parliament has a heavy heritage of disconcerting difficulty from the old Parliament; and we must not be too hasty in our judgments. Mr. Braithwaite also criticizes the electrical schemes. He characterizes as fallacies the ideas that cheaper electricity will be promoted by super-generating stations employing large units of plant, and that the erection of the generating stations at the collieries will also tend to economy. While increased economy of generation may be obtained by large units, the risk of serious breakdown is shown by experience to be by no means negligible. A comparatively small increase in economy of generation might be bought too dearly; it might increase the risk of a serious interruption of supply. Regarding the second point, it is the deliberate opinion of Mr. Braithwaite that any advantage derived from the avoidance of the conveyance of coal from collieries to generating stations would be more than lost by interest and sinking fund on the cost of the transmission lines, the loss of energy in transmission, the cost of constructing and maintaining the reservoirs at the collieries, the risk of interruption through damage to transmission lines, or of stoppage of the coal supply by an accident or strike at the colliery. In ordinary circumstances, London can take its pick of coal from any colliery in the country; and the freight of waterborne coal before the war was only 3s.

to 3s. 6d. per ton. In these circumstances, Mr. Braithwaite can foresee uneconomy and not economy emerging from the schemes that the Government are fathering. The distribution of coal by wagon or ship is far better than the distribution—particularly over long distances—of the comparatively small proportion of the potential heat energy of the coal that electricity succeeds in preserving. Assuming coal carbonization at the pit head, there will still be the bye-products to be distributed. Through gas-works, these are at the present time made available all over the country, which is good for its general development, instead of carrying-out schemes which will ensure development on patchy lines, so enlarging the prosperity of parts of the country to a greater extent than other parts. Coal is an extraordinarily good and compact method of distributing energy and other useful things needed in all quarters of the country.

The Government Scheme and Extensions of Existing Plants.

Everywhere schemes for the local development of electricity supply are being considered; and opposition simultaneously develops against the inclusion of electricity supply in the "Ways and Communications" project. The one body favoured up to a point is the Board of Electricity Commissioners; but "Meteor" of the "Electrical Times" has knowledge of permanent bodies that have become petrified and moss covered. He wants to ensure against this by introducing something that will in this case prevent those things happening. But when (if ever) the Electricity Commissioners are appointed and set to work, they will find an awful tangle to unravel, which is not being improved by the efforts that are being made by the present possessors of electricity concerns to stabilize still more firmly their positions. Schemes great and small are being produced. On one page of an electrical contemporary before us as we write no less than sixteen paragraphs refer to schemes of extension or development of one sort or other. If such schemes are allowed, they will offer stronger resistance than ever to the electrical co-ordination and reconstruction that have been adumbrated as the policy of the Government. We referred last week to what Birmingham is doing. Now we see Local Government Board inquiries have been held at Bradford to consider an application for sanction to a loan of £295,125 for extending the electricity works. The Huddersfield Corporation are asking for £90,000 for the same purpose; and Nottingham, for £75,800. So the game goes on merrily. The Inspector has been told how well and truly the interests of the localities have been served, and what a rush of applications there have been for connections since the armistice. Probably the Inspector will fully understand that this "rush" constitutes the accumulations of war time; so that there is really nothing remarkable about it. Abnormal times bring abnormal experiences.

Reasonable Outside Shop Lighting.

It will be quite a good thing if the "Safety First" Council succeed in bringing about a modification of the barbaric forms of outside shop lighting that were seen in pre-war times. The Council recommend that the return to pre-war lighting should be subject to the important qualification that diffused lighting on scientific principles is substituted for glaring naked lights and to the elimination of the sudden transitions from comparative brightness to darkness and *vice versâ* which formerly obtained in the streets of the Metropolis. In order to avoid excessive contrasts, it is also recommended that lights used for illuminating shop windows should be screened, so as to shed only a diffused light on the roadway. Flame arcs and those glaring misnamed "half-watt" lamps will be chiefly affected. We hope the "Safety First" Council will have success in their endeavours to free our streets from insane lighting. There is a point in the volume of light as there is in intrinsic brilliancy that is good and worth striving for. Anything beyond is waste or undesirable. But to realize what is wanted, commercial interests will have to fall before what is scientifically ruled to be sufficient. The revenue of some electricity concerns may drop away; but then the rates charged for these outside lamps have been very much "cut," in order to compete with the popular high-pressure gas-lamps, which do not flicker, which give a soft genial light, are of low intrinsic brilliancy compared with arc or "half-watt" lamps, and the additional virtue of relative cheapness is something which has also commended itself.

In reference to the announcement in last week's "Journal" that the Royal Automobile Club and the Commercial Motor Users' Association had agreed to make the necessary financial provision for a programme of research work at Manchester University on the subject of the use of alcohol as motor fuel, it should be pointed out that Prof. Harold B. Dixon, F.R.S., who is in charge of the research work, is giving his services without payment.

The Nineteenth Annual Meeting of the Manchester and District Junior Gas Association is to be held next Saturday afternoon, at the Grosvenor Hotel, Deansgate, Manchester, to be followed by tea and a social evening. In addition to the formal business of the meeting, Mr. W. Fletcher, of Liverpool, will deliver his Presidential Address; and a presentation will be made to Mr. A. L. Holton, late Hon. Secretary to the Joint Council of Junior Gas Associations.

COAL AND ITS CONSERVATION.

Power Supply as a Reconstruction Problem.

In his third Cantor Lecture at the Royal Society of Arts yesterday week Prof. W. A. Bone, D.Sc., Ph.D., F.R.S., dealt with the question of power supply in relation to the scheme of reconstruction. On this occasion we have had to condense the lecture; but the following gives its main features.

Prof. Bone said: You are probably aware that among the various and numberless Reconstruction Committees set-up during the war, one was appointed to report on the question of coal conservation; and the Power Sub-Section of the Committee published a report in which they recommended the adoption of proposals for a comprehensive system of electric power, ultimately destined to supply the whole country. This report has met with a mixed reception. There has been a good deal of criticism, and some support. But the question is going forward, and some action will probably be taken in the near future. As I was a member of the Committee and of the Power Sub-Section, I thought perhaps the best way in which I could deal with my subject would be to explain what considerations affected me most in coming to the conclusion expressed in the report—that is to say, to explain what I think the report means, and, at any rate, how to me personally the conclusions appear.

Looking Forward.

In the opinion of many competent judges, the question of increasing and reorganizing the supplies of power for industrial purposes is one of the most important problems which the country will have to undertake during the coming decade of reconstruction. I use the word "decade" advisedly because the work of reorganization will not be accomplished in so short a time as a year or two. But it may be expected that those of us who may be alive in 1930 will see in operation a comprehensive scheme for public power supply and distribution on co-operative lines, either under national control, or at any rate so organized and administered that every power user in the country will have the right to participate, according to the magnitude of his requirements, on the same terms and conditions as all others. If such a scheme can be devised and put in operation, there is no doubt that power production will on the whole be much more efficient than it has been in the past, and that important industrial and social consequences will follow.

Distribution of Power.

Notwithstanding the fact that every factory or workshop in the country requires power in some form or another, and that more than 97 p.ct. of such power has been derived, directly or indirectly, from coal, it may seem strange that so little has hitherto been done in the way of generating power co-operatively. There are installed throughout the kingdom engines of various sorts (but mainly steam-engines) of a total nominal capacity of somewhere between 10 and 15 million h.p. The 1907 Census of Production—which are the latest official figures available—accounted for 10 million h.p. (exclusive of railway locomotives) in the factories throughout the kingdom. The distribution of this power was somewhat as follows:

25 p ct.	at mines and quarries.
20 „	at iron, steel, engineering, and shipbuilding works.
20 „	in textile and clothing factories.
18 „	in public utility services.
17 „	in all other industries.

Among other interesting figures I find that—

91·2 p.ct. were steam-engines	{ 5 p.ct. turbine. { 86·2 p.ct. reciprocating.
6·4 „ „	internal combustion engines.
1·7 „ „	water-power machines.
0·7 „ „	other kinds of machines.
100·0	

Of the total capacity of prime movers, 26 p.ct. was associated with electrical plants (that is to say, dynamos generating electricity), and about two-thirds of the latter were engaged in public utility service. The total amount of electricity annually generated in the country in 1907 was 2388 million kw. per annum (equal to 273,000 kw.-hours), of which 1495 millions, or about 62·5 p.ct., were generated in connection with public utility services. The internal evidence of the report also shows that—

(*a*) Practically all the public utility plants were electric. Whenever power was generated co-operatively it was in the form of electric power.

(*b*) That the average load factor on the latter was only about 16 p ct., for—

$$\text{K.W. hours generated} = 170{,}000 \qquad \frac{170}{1053} = 0{\cdot}16$$

$$\text{Capacity of dynamos in operation} = 1{,}052{,}783$$

Cause of Persistence of the Individual Provision of Power.

The individualistic basis upon which practically the whole of the mechanical power was generated in this country during the nineteenth century was the outcome of the natural limitations under which the steam-boiler and engine labour, unless associated with the dynamo, which was only invented and developed

much later than the steam-engine. The steam generated in a boiler cannot be carried more than a very short distance without total loss of its energy by condensation; so that the engine must be in close proximity to the boiler, and the transmission of power from the engine by shafting imposes a similar limit on the other side. Consequently, not until either the gas-engine or the dynamo had been sufficiently developed to make it a reliable and efficient commercial machine, was it at all possible to propose any scheme of co-operative power production and distribution; and by that time the individualistic basis had become so firmly rooted that men's minds hardly contemplated any other.

Before the advent of the gas-engine or the dynamo, all coal consumed for power production in steam plants had to be conveyed to each particular factory using the power; and it was to the demands for cheap and rapid transport of coal which arose between 1750 and 1850 that we owe the inception and development first of all of our canals, and afterwards of our great railway systems. For (as Jevons remarked) "until coal supplied the purpose, there was not spirit enough in this country to undertake so formidable a work as a canal;" and George Stephenson used to say that his locomotive engine was destined to bring forth the strength of Britain lying in her coal and iron beds. Hence, in those early days the system of power distribution necessarily took the form of conveying the raw coal to each factory, where its potential energy was transformed into mechanical power *vice* steam-boiler and engine, and the power distributed over a limited area through shafting.

Influences in Development—Gas-Engine and Dynamo.

With the advent of the internal combustion, engine, however, it became possible to utilize gas from the public mains for power production. And since gas can be distributed over considerable areas at comparatively small cost, this opened-up the first prospect of collective power arrangements, at least so far as small power users were concerned. But I think it is clear that such a system has certain obvious limitations which I need not dwell upon; and it does not get rid of the necessity of having the power generator (the engine) in close proximity to the place where the power is used.

It was the invention and development of the dynamo and electric motor that finally solved the difficulty, and made it possible, at the beginning of the twentieth century, to organize big public power schemes on the principle that the power required in a given industrial area shall be generated at the particular place or places (within or without it) where it can be most economically produced. Thus electric power is produced from the falling water at Niagara, and distributed through cables to Toronto and other places in Ontario, while in this country the North-East coast electric power scheme affords a good example of how the energy of coal can be similarly distributed for a limited number of large central generating stations over a considerable area.

Field for Collective Power Supply.

If it be agreed (and, for the purposes of this lecture, I must make this assumption, because I have no time to argue it) that power may be most efficiently applied to industry by the medium of electricity—which is a proposition that to my mind may be accepted as proven—then undoubtedly there are great advantages to be gained in the way of cheap production by the co-operation of consumers with a properly-organized electric power company operating over a large industrial area. And probably no other European country is so well adapted as our own for such co-operative schemes, because of the compactness of our great industrial areas, the densities of their population, and their proximity to the coalfields. In every industrial area, there are factories normally working during the day only; others must of necessity work both day and night without ceasing. In some cases, the power requirements are fairly uniform throughout the day's run; while in others the requirements are subject to large and abrupt variations.

Some establishments—for instance, steel rolling mills—have intermittent loads for short periods far in excess of their average hourly requirements; others again—as for instance, bye-product coke-ovens or blast-furnaces—have large surpluses of gas which cannot be fully utilized on the plant itself. Other factories, also, may have surplus energy to dispose of in the form of so-called "waste heat" or of unutilized "exhaust steam." In every large industrial area there are enormous energy losses continuously going on in different ways, which the individual manufacturer is either unable to utilize effectually himself or about which he is indifferent.

Suppose that the manufacturers in such an area, instead of maintaining a large number of independent, and probably some of them inefficient, power stations of comparatively small sizes, were to co-operate in a well-organized electrical power scheme, whereby all the separate factories, with their variable demands, are linked up with a few large and efficient power stations, suitably situated in regard to coal supplies, and equipped with the latest generating machinery in considerable units. And suppose, further, that the organizing company (and I am not here concerned with the question as to whether it should be publicly or privately controlled, as I am not here to discuss politics, but only the technical proposition) are prepared not only to sell electrical energy, but also to purchase surplus gas, waste heat, and exhaust steam from any of its customers, and convert the same into electrical energy, it is fairly obvious that, in such circumstances, greater economies could be achieved by reasonable co-operation than would be possible under any purely individualistic scheme. I am putting the proposition as it appears to me, and the considerations which led me to believe in co-operative production.

Necessity for Increasing the Productivity of Labour.

As was said in my opening remarks, the question of cheap and efficient power supply to our factories and workshops is one of the most important problems of reconstruction we have to face during the next decade. Everyone is agreed that our colossal war debt can only be paid-off by vastly increasing the productivity of labour; and it is only by enlarging the amount of power used in industry per worker employed that the net output of the individual worker can be increased. By net output is here meant the value added by the worker to the material he operates upon—that is, it is the selling value at the factory minus the cost of the material used. Clearly (except in a country ruled by Mad Hatters) a worker cannot be paid wages more than a certain proportion of the value he adds to the materials. If he already receives such fair proportion, he has no justifiable ground to demand more, unless or until he increases his net output. According to the Census of Production, the average net output per worker in 1907 was only £102 per annum, out of which had to be paid not only workers' wages, but also establishment charges and interest on capital. Hence it follows that if the net output, and consequently wages, are both to be increased, more power per worker must be employed in industry. The worker is now demanding more wages. The only cure for low wages is more net output per worker; and the latter involves more power per individual worker. The economic needs of our day, and without which we cannot hope to recover our former prosperity, are: (1) Cheap food, (2) better housing, (3) higher scientific and technical training, (4) more motive power (and relatively cheap coal), and (5) a reorganized transport and distribution system.

Before the war, each worker in the United States had on the average 56 p.ct. more power at his disposal than his *confrère* in Great Britain. Indeed, if industries in which comparatively little power per worker is used be eliminated, it is probable that in those industries where power is mostly used—like engineering—the American worker used about twice as much power as his British competitor. Hence his net output was much greater, and his real wages were higher than he would have received over here. The American artizan is, I think, undoubtedly better educated, and understands how much he benefits by increased output; and accordingly he works for it. Unfortunately, his *confrère* in this country thinks differently. His ideas seem to be: (1) That the sum-total of material requirements of his market is a fixed quantity; and therefore no more than a certain quantity of commodities can be absorbed within a given time. (2) That, if an individual worker produces in a given time more than a certain net output, he does so to the detriment of his fellows. Consequently, the net individual output must be limited by rules; and no worker must be allowed to exceed such limit. This is the British workman's idea of economics; and ultimately it would be, if pursued far enough, disastrous to the country. We need to change this point of view of the worker; we need all other classes of the community to realize that the whole country must work for increased output; and if we want this, we must be prepared to put into operation more power than we had previously.

A Wasteful System.

There can be no doubt that before the war power was, and is even now, generated on the average very inefficiently in most mines and factories. It is impossible to give a precise figure for coal consumption per B.H.P. produced. Unfortunately there are no data for the whole country on which to base such an estimate. I have, however, examined a great many statistics, and have made some calculations, from which there are grounds for believing that it was not less (and probably more) than 5 lbs. per B.H.P. hour. Accepting this figure as the basis of discussion, it would mean that, on the average, we are only utilizing about 4 p.ct. of the available energy in the coal burnt; the other 96 p.ct. being wasted. This consideration ought alone to make us profoundly dissatisfied with the present system.

Fields for Gas and Electricity.

Personally, so long as I have been in a position to exercise any independent judgment upon this question, I have always believed the principle of co-operative power production in a densely populated industrial country such as ours would ultimately become the accepted custom. If such a principle is to be accepted, there seems to be no other really effective way of putting it into operation except through the medium of electricity. For just as gas is the most suitable form in which heat energy can be distributed and applied in our factories and houses, so power is especially the field of electricity.

This question is giving rise to some little disputation. You had a paper last week in which a distinguished engineer, Sir Dugald Clerk, endeavoured to delimit the respective fields of gas and electricity. I am quite aware there are differences of opinion, but, personally, I have had to consider both gas and electricity in connection with power, light, and heat. I am perfectly convinced if I want heat, then (except for very special purposes) I am going to use gas. On the other hand, if I am going to generate power for industrial purposes, I shall in most cases adopt electricity. The question as to whether I use a gas-engine or a steam-turbine as

the prime-mover is after all quite subsidiary to the main point. The point that is of special interest in this discussion is: Are you, or are you not, going to include the electric-motor in your cycle? It does not matter what your prime mover is. It is subsidiary; and I cannot understand anyone saying to-day that the future field for power is going to be, on the whole, anything but that of electricity. To show you I am quite impartial as to gas and electricity, I may say if heat is wanted in a convenient form, I should certainly distribute it as gas. If you take coal at 45s. per ton, gas at 4s. 6d. per 1000 c.ft., and electricity at 1½d. per unit, then it would be found you could buy for one pound sterling (or shall we say a "Bradbury") 13,350,000 B.Th.U. in the form of coal, 2,250,000 B.Th.U. in the form of gas, and only 550,000 B.Th.U. in the form of electricity. Our gas appliances are more efficient than our coal appliances; and our electric appliances are more efficient than our gas appliances. But with the coal heating appliances, you usefully utilize 4 million B.Th.U.; with the gas appliances, 1,800,000 B.Th.U.; and with the electric appliances, 500,000 B.Th.U. You would have to be a very wealthy man to be able to afford to use electricity for general heating in your house, and except for special purposes (*e.g.*, electric steel refining) where very high temperatures are required, it would be ruinous to use it for large scale heating operations in factories. The question of whether gas or coal is to be preferably used for domestic heating purposes in any particular case must be settled by each individual householder, who (if he is wise) will consider not only the first cost of the fuel used, but also the question of the greater cleanliness and convenience of gas (*i.e.*, the labour element). It is a matter of personal choice. But there is no question that electricity ought to be absolutely ruled-out for house heating, except in the houses of the very wealthy. Having said this, you will see I am not here to advocate electricity as a panacea; there are no such things as panaceas in this world, and you have to exercise your judgment. There are limits beyond which a specific commodity does not pay to use; and the proper scientific view is to try to find out what are the particular fields or the maximum uses of the various forms of energy or commodities which are at our disposal for effecting certain purposes.

Advantages of Co-Operative Power Production.

Well now I want to discuss briefly the advantages of co-operative power production. The production of power is becoming more and more a specialized process. In the old days, it was thought that anybody could burn coal; and the worst of it was anybody was allowed to burn it. By this time, however, it ought to be understood by the business community that there is a science of combustion and heat transmission; and that if fuel economy in industry is to be realized men must be trained who will understand and apply this science. You will not tell me if you train up a certain proportion of your engineers in this way, it is not the right thing to do to assure getting the best results. Then we know that the most economical generation of power is only possible with larger units, and a better and more constant load-factor than most individual establishments can employ. Hence the capital expenditure for the total horse-power required in the country will be greatly reduced. For instance, a manufacturer who has to supply his own factory must put down machinery of a capacity sufficient to meet his maximum demand. If he does not, he is "done." If he is coupled-up with a scheme of power supply, then the people owning the generating station do not have to consider his maximum demand, but his average demand, and consequently can provide for the normal consumption of power much more economically in the way of calculated expenses.

Again, in large power stations, equipped with the largest and most modern units, superintended by specially trained fuel and power engineers, it is possible to burn under the boilers with good average results inferior grades of coal. Also the recovery of bye-products would be more feasible in connection with such stations than with small private plants. Some coals are so soft and friable in texture that they will not stand transport at all. I have seen large quantities of such coal left behind in the mines, and lost to the country. I have seen coal which is mixed in such a way with the combustible material that its calorific value is so low that, unless it is burned in special appliances, and under the supervision of specially trained men, it will not often be bought or looked at. Now if, by certain special devices and certain special arrangements, we can use this coal—soft coal or low-grade coal—if we can ultimately get 10 p.ct. efficiency out of it, instead of its being left down the mine, it is going to be an economy to the country.

Therefore, one of the principal points I want to leave with you this afternoon is that a co-operative electrical scheme is going to enable you to use some of the low-grade coals which are not being extensively used now. This is a point which the critics of the scheme have apparently overlooked; they have all assumed that we are going to use the best steam coal. Not at all. The schemes are going to prolong the life of the coal measures, and so liberate some of the best steam coals for exportation. Is not this an important ground of public policy?

Another consideration is that co-operative production means that the small manufacturers and rural industries generally will have cheap power at command. Also an electric motor would become part of the equipment of every house—a great boon to over-worked housewives. I am not looking at this from a narrow point of view, but from the broad point of view of public policy, and as a social question. The fact is that if you want to develop rural industries, it is largely a question of power. If you are going to relieve your domestic staff, electric power is going to help you. If you do not adopt some comprehensive electric power scheme, then other countries are going to have a better time than this one.

Present System of Power Distribution.

I have shown you that about 18 p.ct. of our power is generated in undertakings presided over by 600 authorities in as many separate districts. This is technically wrong, and commercially uneconomical. It is as though our railway system were composed of innumerable small undertakings (municipally or privately owned) with half-a-dozen different gauges, indiscriminately laid out, so that it was impossible to run a through service of goods or passenger trains between (say) London and Manchester, or Bristol and Newcastle. Also, the average size of the generating stations (5000 H.P.) is only about one-fourth what should be the smallest machine in a modern public generating station.

Hitherto, local jealousies, as well as vested interests, which our lawyer-ridden Parliament has fostered far too much, have blocked, and are still blocking, the way. How often in the past, in connection with water, gas, and electric light schemes, has Parliament encouraged the formation of small rather than of large and more efficient undertakings—a policy which has proved as disadvantageous to the community at large as it has been profitable to the lawyers who frequent the Parliamentary Bar. A typical example of this sort of thing is afforded by the public electricity supply for Greater London (with an area equal to some 693 square miles, and a population of 7¼ millions), in which there are, or were recently, no less than 65 separate authorities supplying electricity, upon 49 different systems, from 70 generating stations containing 585 engines, and distributed at 24 different voltages to the consumer, who is charged at one or other of over 70 different rates and prices!

The average size of the generating stations is only 5285 K.W., and of the generating units only 632 K.W. Many of the older stations contain reciprocating engines, and some have even to cart their coal—a truly ridiculous state of affairs. But, notwithstanding these disadvantages, London's demands for current per head of the population has increased fivefold since 1900, and is still expanding. There is probably no area in the world which, in regard to density of population, easy access by sea to abundant fuel, and possibilities in the way of rapidly expanding demands for electricity both for power and lighting, is more admirably adapted for the development of a public supply of cheap electricity under a single authority, with consequent great economy of fuel and in the cost of production generally. How long will the people of London allow these natural advantages to be nullified by the short-sighted policy which has prevailed hitherto?

The Committee's Proposals.

The Coal Conservation Committee (Power Section), having considered the whole question from a technical standpoint, made certain recommendations which, having been substantially endorsed by the Board of Trade Electric Supply Committee, will probably form the basis for legislative proposals in the near future; and it will be for the country to say whether or not it desires to have the scheme put into operation. It is proposed:

(*a*) To divide the country into a limited number of areas (sixteen are suggested) throughout each of which there shall be a standard periodicity and trunk-main voltage.

(*b*) The generating plants and units within each area shall be of the largest size required to ensure the maximum fuel economy, and general efficiency in working. Units of not less than 20,000 H.P. ought to be used, and in the largest stations, 50,000 H.P.

(*c*) Such plants shall be put down in the most favourable place or places for economical generation—as a rule, either at the pithead, where a very inferior coal has to be used, or near a river or estuary where condensation facilities are best.

(*d*) The main trunk system would collect any waste power (surplus gas or waste heat) available, which (after conversion into electric current) would be distributed to where it can be profitably used.

On all these points, Prof. Bone expatiated; but here we must be content with the outline of the proposals. In what succeeds, too, we give merely a sketch of the remaining points which came within the scope of this concluding lecture:

Choice of Prime Movers—Gas or Steam Engine.

We shall not be far wrong in assuming for our present purposes that the heat equivalent of the available energy in 1 lb. of a good average coal is 13,000 B.Th.U. Inasmuch as the heat equivalent of a horse-power is 2564 B.Th.U., it follows that, were we able by any means to transform the available energy in coal into mechanical power without loss of any kind, we should obtain a horse-power-hour output of work by the expenditure of about 0·2 lb. of coal.

There are two principal ways in which we may convert the energy of coal into mechanical work. One is by raising steam in a boiler and then utilizing as much as possible of the energy of the steam in some form of steam-engine, either of the reciprocating or turbine type; the other by gasifying the coal completely in some form of gas-producer, where the incandescent fuel is converted into a mixture of CO_2, CO, H_2, CH_4, and N_2, under the action of a steam and air blast, and then burning the resulting

gas in an internal combustion engine. Both these methods are, of course, imperfect; but it may perhaps be of interest if we compare them from the point of view of thermal efficiency.

In the first place, the thermal efficiency of a good modern type of coal-fired boiler is not far short of that of the gasification of coal in a gas-producer, when allowance is made for the fact that it is necessary to clean and cool the resultant gas before it is delivered to the engine. We shall not be far wrong in putting down the efficiency of each method under good working conditions at about 75 p.ct. Now, under favourable working conditions, a gas-engine will convert about 27 p.ct. of the energy of the gas supplied into available horse power, so that the coal consumption required to obtain a shaft-horse-power-hour by means of the combination of an efficient gas-producer and a gas-engine need not be more than 1 lb.

$$\frac{0{\cdot}20}{0{\cdot}75 \times 0{\cdot}27} = 1 \text{ lb. per B.H.P.-hour.}$$

Fifteen years ago, the efficiency of the best type of reciprocating engine was not more than about 13·5 p.ct.; so that the combination of the best steam-boiler and engine of that day did not convert more than perhaps 10 p.ct. of the available energy of the coal into shaft-horse-power. Hence the coal consumption of such a system would be:

$$\frac{0{\cdot}20}{0{\cdot}75 \times 0{\cdot}135} = 2{\cdot}0 \text{ lb. per B.H.P.-hour.}$$

During recent years such great advances have been made in the development of the steam-turbine that it has for the time being entirely out-distanced the gas-engine as a power station machine, except for small units of (say) less than 3000-B.H.P. capacity. According to the published results of trials on the new 35,000 H.P. Parsons turbo-alternator erected at the Fisk Street Power Station in Chicago, the fuel consumption on so large a turbine steam set (assuming a boiler efficiency of 75 p.ct.) has now been reduced to 1 lb. of coal per shaft-horse-power-hour. There is thus now probably little to choose between the thermal efficiencies of the best types of steam and gas systems, each working under the most favourable conditions. But from the point of view of the size of units, the turbine has shot far ahead of its rival. The Parsons turbo-alternator recently installed at Chicago is 35,000 H.P. capacity, far surpassing anything yet attempted with an internal combustion engine unit. Whereas a gas-engine only works at its highest efficiency with a high load factor, a turbine maintains its efficiency over a wider range of load than its rival, and at a low load far surpasses it. A gas-engine requires much more lubrication, but on the other hand usually less cooling water than a turbine; and, owing to its simpler construction, the turbine requires less adjustment and repairs, and is more reliable than its rival.

These considerations have led to the almost universal adoption of the steam-turbine for large power stations, except in cases where there are available supplies of surplus gases from coke-ovens, blast-furnaces, or the like. Sir Dugald Clerk, from this place last week seemed to me to argue rather against the employment of steam turbines in power stations. He said the efficiency of the best electric power station to-day was no more than 13 p.ct. I think the general reply to this is that the large power station has adopted the big turbine. This has not been by magic, but by results. On the other hand, for comparatively small units—(say) up to 3000-H.P.—where the load factor is uniformly high and not subject to abrupt variations, the gas-engine has certain advantages. In any case, however, the choice between the two rival systems will not usually be determined on purely thermal considerations, but on other equally important factors.

Economy of Large Generating Stations.

What Prof. Bone said on this subject can be conveniently summed up as follows:

(*a*) Better condensation facilities.

(*b*) Makes possible the large machine with higher boiler pressures (450 lbs.) and complicated but more efficient steam cycles. High boiler pressure with large turbo-alternators give greater thermal efficiencies than are possible on any combination in smaller sets; for very high steam pressures are not economical with small turbines because of larger proportionate cleaning.

(*c*) The use of very large machines, employing complex steam cycles, is not justifiable unless the load factor is good (which should be at least 50 p.ct. or more).

Coal Economy at a Large Station.

(*a*) *Coal used* = 10,500 B.Th.U. per lb. (poor quality).

(*b*) *Actual consumption* = 19,500 B.Th.U. per KW.-hour sent out

(*theoretically* 3435 B.Th.U. per KW.-hour).

$$\textit{Efficiency} = \frac{3435}{19500} = 0{\cdot}176.$$

There has been some misunderstanding on this question. I see my friend, Prof. Cobb, who followed at the Leeds University, in an article in the current number of the "Edinburgh Review," and Sir Dugald Clerk last week have said that the best electric power station is working with 13 p.ct. thermal efficiency. I think we can do something better than that. I am informed on good authority, and I am authorized to say that, at one of the largest power stations in this country, using an inferior grade of coal (10,500 B.Th.U. per pound), the actual coal consumption corresponds to an expenditure of 19,500 B.Th.U. per KW.-hour sent out. If you calculate this out, you will find that it is nearly 17½ p.ct. efficiency. Therefore the figure Prof. Cobb and Sir Dugald Clerk have adopted may be improved upon, and is being improved upon. In one of the much-derided super-stations now in course of erection in this country, and which will probably be in operation by the end of the present year, the plant has been so designed that it is confidently anticipated that no more than 16,000 B.Th.U. will be expended per KW.-hour sent out. The efficiency will therefore be quite 20 p.ct. They expect it will be a little higher. If this is so, then I think that the whole of the criticism on the thermal basis has been answered in regard to this scheme.

I have endeavoured in brief outline to explain the grounds of the scheme as recommended; and I think that a very strong case can be put forward in support of the Committee's recommendation, and that the critics have really not touched the main issues involved. I personally hope that the country will take up this matter and carry it out on some comprehensive lines. It is nothing to do with the question of whether the system should be owned by the Government, by municipalities, or by private enterprise. I have my doubts about the nationalization of such things.

Before concluding the lecture, Prof. Bone threw on the screen a number of photographs illustrating the immense operations of the North-East Coast Company, which is a large example of co-operative electricity supply. In this system, where waste gas is used, it is burned under boilers for the generation of steam. The lecturer went on to show pictures of the Skinningrove Iron-Works, where they have completed arrangements for making steel sections with a total consumption of 1·6 tons of coal per ton of finished section. If it were not for electricity, he remarked, this could not possibly be done. In this case the waste gas is used in a 1600 KW-hour gas-engine. This, he said, was the first electric-driven rolling mill to be put into operation in this country. Molten pig iron is converted into steel in open-hearth furnaces heated by the gas from the blast-furnaces and coke-ovens. No more coal is expended in doing this; and the highest economy possible had there been achieved in connection with the manufacture of steel, through the application of electricity generated by the explosion of a mixture of gas and air in an internal combustion engine. Prof. Bone believes they have sent out current at Skinningrove at 22½ p.ct. efficiency, having regard to the heating value of the gas taken.

On the motion of Dr. M. O. Forster, seconded by Mr. W. H. Patchell, a hearty vote of thanks was passed to Prof. Bone.

Presentation to Mr. R. S. Tobey.

At the last monthly meeting of the Commercial Section of the Southern District Association of Gas Engineers and Managers, a presentation of a handsome piece of plate, consisting of a silver tea set and salver, was made to Mr. R. Seymour Tobey, the Hon. Secretary of the section. It was inscribed:

> Presented to R. Seymour Tobey by the Members of the Commercial Section of the Southern District Association of Gas Engineers and Managers, March, 1919.

In handing over the gift, Mr. W. E. Price, of Hampton Wick, one of the founders of the Commercial Section ten years ago, mentioned that soon after the inauguration of the Section, Mr. Tobey was appointed the Hon. Secretary; and as a result of his energies, and the unfailing courtesy that he extended to the members, the section had grown until nearly a hundred undertakings were members at the present time. Mr. Price also pointed out that this was a unique presentation, as Mr. Tobey was not giving up the Hon. Secretaryship; it was presented to him for the hard work he had undertaken on their behalf, and especially for the amount of extra work of the last four years. Mr. Tobey expressed his hearty thanks to the members for their handsome gift—saying that he would treasure it the more because of the happy memories he had of the kindness of members in the past.

Temporary Increase of Charges Act.—The Newtown and Llanllwchaiarn Urban District Council have made application to the Local Government Board for an Order under the Statutory Undertakings (Temporary Increase of Charges) Act.

Eastern Counties Gas Managers' Association.—The Spring Meeting of the Association will be held at Bury St. Edmund's on May 1, when the programme, in addition to the ordinary business, will consist of the Presidential Address of Mr. H. R. Wimhurst, and a paper by Mr. W. W. Townsend, entitled "Water-Gas Plant at Colchester." The members will be entertained at luncheon by the Chairman and Directors of the Bury St. Edmund's Gas Company; and the Hon. Secretary (Mr. F. M. Paternoster) says it is also proposed to revive the evening dinner.

New Capital Issues.—The Lords Commissioners of the Treasury give notice that, pending the amendment of the Defence of the Realm Regulation 30 F, they have made a general license for issues of capital by companies resident, and carrying on business, in the United Kingdom for capital purposes within the United Kingdom, provided that in every prospectus offering to the public for subscription or purchase any issue made under such general license a statement is included that "no part of the proceeds of the issue is to be applied for capital purposes outside the United Kingdom or to replace money which has been so applied."

COKE-OVEN MANAGERS' ASSOCIATION.

MIDLAND SECTION.

A Meeting of the Midland Section of the Coke-Oven Managers' Association was held on Saturday last at the Danum Hotel, Doncaster—Mr. J. A. Wilson (the Chairman of the Section) presiding over a large attendance.

The Chairman said it was a great pleasure to him to offer, on behalf of the Midland Section, a hearty welcome to the President of the Association, Mr. B. V. Hollingworth, F.I.C., F.C.S., of Birchenwood, who had come down that afternoon specially to address the section.

Mr. Hollingworth, before proceeding with his address, said he need hardly mention that he valued very much the privilege of being able to address the Midland Section. He considered it his duty, as the President, to make as close an acquaintance with the members of the Association as circumstances would allow. He recognized that the office of President was one of considerable honour and responsibility. In making this visit to the Midland Section, he was carrying out what he considered to be one of his principal responsibilities in taking a share in the section's transactions. He thought when a President presumed to address the members of his association he ought to endeavour to deal with some subject which would be of value to the industry as a whole. This was the reason he had chosen the subject of his address, which he then proceeded to deliver.

COKE-OVEN GAS FOR THE PRODUCTION OF HEAT, LIGHT, AND POWER.

Perhaps the most serious and important problem now exercising the minds of all who have to deal with fuel in its various forms is that of the conservation of our coal supplies and the economical production of heat, light, and power. This problem is one of the greatest importance to the coke-oven industry, both as regards the magnitude of the industry and because of the fact that it cannot be said that the most is at present being made of the gas obtained by carbonizing coal in coke-ovens. I should like to refer to a passage in the Presidential Address which it was my privilege to deliver before the Association, wherein it was stated that the future development of the coking industry would probably be in two main directions—viz., that coke-oven plants would become (1) large heat, light, and power producers, or (2) large centres of chemical activity. It is with a view of assisting in the development in one of these directions that the following notes are presented.

Having regard to the important bearing that this subject has on the conservation of coal, and in view of the fact of the projected centralizing of heat and power production, and also because of the great change now taking place in carbonizing methods, this is certainly an opportune time to draw the attention of public supply authorities to the advantages of coke-oven gas for the above purposes. I am one of those who believe, notwithstanding the extravagant claims of electrical engineers, that the very best and most economical way of treating coal for the production of heat, light, and power is by carbonizing the coal and subsequently recovering gas, coke, and bye-products. I also believe that the very best way of carrying out this carbonization is in the modern bye-product coke-oven, which ensures the production of a large quantity of cheap gas, the maximum yield of products, and the best quality of coke.

Closer Co-Operation between the Gas and Coke Industries.

Perhaps I may be permitted to say also that, just as we consider coke-ovens to be the ideal carbonizing system, so also it must be agreed that the existing gas-works distributing organization is the best and most efficient. For these reasons I think there is great need for closer co-operation between the gas and the coke industries. On the one hand, such co-operation would result in the gas distributing authorities being supplied with a cheap and suitable gas without the necessity of spending money on extensions; and, on the other hand, it would result in a remunerative outlet being found for spare coke-oven gas, which in many cases is not now being economically used. Of course, it should not be understood that I am recommending the universal use of coke-oven gas by gas authorities, but only where the circumstances of geographical position, availability of supply, and the necessity of gas-works extension to carbonizing plants, &c., justifies its serious consideration.

Availability of Coke-Oven Gas.

In pleading for the extension of the use of coke-oven gas for town purposes, it should not be understood that I am confessing to the fact that coke-oven gas is at present being wasted to any large degree. But it is certainly true that it is not being employed for purposes which utilize in the best way its full and more special value. Generally speaking, it may be stated that wherever coke-ovens are situated in reasonably close proximity to large centres of gas consumption, and have quantities of surplus gas available, there should be no technical or commercial barrier to the utilization of such gas for town purposes. Further, the quantity of such surplus gas available could be greatly increased by the adoption of modifications in coking plant and practice if a demand were created for the gas. It is well known that on most coking plants, especially those of a regenerative type, large quantities of heat and gas are used in directions known to be wasteful—*i.e.*, in firing boilers, &c. If such gas could be sold at reasonable rates, other and more economical methods of steam-raising would quickly be found. It is doubtful if it has been properly realized how important a part the possibility of economically using the spare gas from ovens has played in the choice of the system of oven put down.

Where there has not been any possibility of properly using the spare gas, the non-regenerative type has in most cases been chosen, because of its lower cost; but where the spare gas could be sold to town authorities, there is no question that ovens of the regenerative type would be invariably chosen. To go still further, wherever new coking plants are erected adjacent to large centres of population, if there was a certainty of a demand for gas for town purposes, there is no doubt that modifications in the heating of the ovens could be arranged so as to permit the whole of the gas produced, and not merely the surplus, to be available for town purposes.

Suitability of Coke-Oven Gas for Town Purposes.

It is to be feared that whatever criticism has been made against the use of coke-oven gas for this purpose, both as regards composition, heating, and illuminating value, constancy of supply, and freedom from impurities, has been based upon the quality produced under ordinary coking conditions, when the quality of the gas was of no importance; whereas these conditions can be greatly modified to give a gas suitable in all respects for town purposes where a production of such a gas was of importance. The modern tendency of lighting authorities to dispose of a gas of lower illuminating power, but of constant and reasonable calorific value, should be supported and encouraged wherever possible by members of the coking industries, not only because of its bearing on the supply of low-priced gas, but also because it permits of co-operation between them and gas engineers, which would not be so readily attainable if a very rich gas of high illuminating power were required.

It may be safely stated that experience has demonstrated, in this country and many others, that coke-oven gas could be made as suitable as retort generated gas for any purposes whatever. The ability of taking-off gas from coal at any stage of its carbonization, by the provision of double mains with suitable adjustment connections between them, enables gas of practically any calorific value to be obtained. At many of our larger coking installations, calorimeters installed for recording the values of the gas supply to gas-engines, &c., have demonstrated that there is no difficulty whatever in ensuring a constant supply of gas of a calorific value between 450 and 500 B.Th.U. gross, even without the averaging effect of a gasholder.

As to illuminating power, while the amount of information available relating to coke-oven gas is not usually so great or reliable as that relating to calorific values, yet there should not be any fear that a suitable illuminating power could not be maintained. This is entirely a question of the quantity of the richer gas reserved for the purpose, or, alternatively, of the amount of re-enrichment of the gas by washing with benzolized creosote prior to delivering it to gas-works mains. With respect to impurities, the advantage would appear to be all on the side of the coke-ovens. The exacting needs of the metallurgical industry, which requires a coke as free as possible from sulphur, compel the use of a thoroughly picked and washed slack. This results in the presence of a lower quantity of sulphur compounds in the gas from coke-ovens—frequently by 20 p.ct.—than in that from gas-works, where it has not been considered essential to employ such a clean class of coal. So far as ammonia and sulphuretted hydrogen are concerned, nothing more may be said than that all these impurities have to be completely eliminated from the gases; and the necessary plant would have to be put down to absolutely ensure this.

Perhaps the greatest difficulty likely to be encountered by the coke-oven manager in the supply of coke-oven gas for town purposes would be the difficulty of ensuring a constant supply. It has been considered that the possibility of miners' strikes would effectually prevent any extension of the use of coke-oven gas; but it should be remembered that gas-works themselves would suffer from the same inability to supply, if it were not for the fact that they usually carry considerable stocks of coal. The same remedy is, of course, equally available to the coke-oven owner. In the case of other labour disturbances—such as strikes of railwaymen or carters—the advantage is again with coke-ovens, since they are invariably situated adjacent to the producing collieries.

Circumstances Justifying the Use of Coke-Oven Gas for Public Services.

It is the generally accepted opinion that coal gas at present offers the best and most economical medium for the supply of energy in the form of heat, light, and power. To ensure this pre-eminent position in the future, however, gas must be supplied at the lowest possible price; and I believe that to those gas authorities who are favourably situated, in the vicinity of coking plants, the possibility of procuring a supply of suitable gas therefrom provides a means of crushing electrical competition for many years to come. Wherever, therefore, large gas-works are situated in the midst of an increasing population and in the neighbourhood of coke-ovens able and willing to supply them with suitable gas, it is to the mutual interest of both undertakings that co-operation

—manufacture on the one hand, and distribution on the other—should take place. This is especially justified where, possibly through long postponement of extensions, the latter are urgently needed, as it can be taken for granted that it would require much less time and money to adapt a coking plant to the supply of the gas than it would to erect a new installation of gas-works plant. There is no question but that, generally speaking, coke-oven proprietors can afford, and are willing, to sell their surplus gas at a much lower figure than any gas-works can make it for. In many cases, it could be bought for less than half what it costs to produce on a gas-works. Since this is so, it will be seen what enormous power is available to the hand of the gas engineer in overcoming competition.

With respect to the maximum distances which coke-oven gas could be economically conveyed, these are much longer than is generally thought. On the Continent and in America, gas has been conveyed quite satisfactorily over distances above a hundred miles. There need be no hesitation in accepting up to fifty miles as being practicable limits of supply; and there are a sufficient number of large towns within this distance of all the coking plants of this country which could take much more than the total gas available therefrom. Any considerable extension in the use of coke-oven gas in the direction indicated would almost render unnecessary the great central power and heat distributing centres of which we are now hearing so much, and the enormous outlay which such schemes entail. Every large colliery, through its coking plant, would naturally become such a centre, and would have the advantage that it would make use of the already properly organized distributing agency of the gas authorities.

Another important reason why gas engineers should give consideration to the use of coke-oven gas is to be found in the great increase in labour costs and difficulties connected with the employment of men. As a result of these, the gas industry is rapidly coming to the decision that relief can only be obtained in systems of carbonizing in which the minimum number of men is employed. Pre-eminent among such systems is, of course, the coke-oven, which can show lower operating costs for carbonizing than among other known systems. This is principally due to the large bulk of coal dealt with per oven per man employed. Coke-oven managers who have had gas-works experience will know the great difference in operating costs in the respective systems, and are confirmed in their belief that the advantage is due to bulk carbonization rendering possible economy in handling. Now if gas authorities are to take the fullest advantage of such methods, they are faced with certain alternatives. Either they must instal in their gas-works large chamber or coke-oven or vertical retorts, or they may take gas in bulk from the nearest coking plant.

Having regard to the enormous capital expenditure involved in the installation of either coke-ovens or vertical retorts, gas authorities will surely be well advised to give serious thought to the great possibilities of taking a portion of the gas they require from the nearest coking plant able to provide them with it. An argument bearing on this subject, of perhaps wider significance on account of its national importance, is that of the possibility of reducing the transport and handling of coal from mine to gas-works by taking gas in bulk from coke-ovens. The cost of these services is, of course, in all cases put upon the price of the coal. Latterly it has been made clear to most gas engineers that their industry is not being supplied with as good a quality of coal as it might be, and schemes of co-operative cleaning of coal—picking, screening, and washing—by gas authorities working together have been seriously considered. By this means the provision of cleaner coal would be possible, and considerable improvement in quality and quantity of gas, coke, and products would accrue.

But such treatment, while saving the cost of transport and handling of useless matter, would still entail the handling and carriage of the moisture left in from the washing process. Taking the whole of the coal carbonized in gas-works at approximately 16 million tons per annum, and the moisture retained by the coal at 10 p.ct., there is seen to be involved the transport, &c., of some 1½ million tons. And it should be remembered that from the mine to the retort this quantity would have to be handled four or five times. The inevitable conclusion that is come to after consideration of these facts is that, wherever gas authorities can obtain gas made from coal, the cost of which has not been inflated by these charges, it should be obtained, and can be obtained, considerably cheaper than if the authorities manufactured it themselves. Such favourably-placed gas companies should therefore cut out at once not only the cost of handling and transport of the impurities and moisture of coal, but of the coal itself, by co-operation with their coke-oven friends.

Terms and Conditions of Supply of Coke-Oven Gas.

Having regard to the stringent regulations (and penalties for infringement of them) to which gas authorities have to conform, it will be evident that the supply of coke-oven gas will require very careful supervision on the part of the coke-oven manager. It may be taken, however, they would be quite equal to the duties, and willing to co-operate with gas engineers so as to provide gas of satisfactory quality. In this matter, one observes a tendency to require a quite unnecessary degree of perfection as to quantity and quality of supply. No doubt this is born of a not yet allayed suspicion of the properties of coke-oven gas, and would disappear with experience. It should be pointed out, however, that the more stringent the conditions of supply, as to calorific power and illuminating power and regularity of supply, the higher the cost to the gas authority purchasing. For to meet such exacting conditions, the coke-oven owner will have to spend more money on apparatus to ensure compliance with them, and will be able to set apart for the purpose a smaller quantity of the richer gas from his ovens, all of which will necessarily make the gas more costly. Undoubtedly the cheapest gas could be sold where it formed only a portion of the total output of the gas authority, in which case considerable latitude in illuminating and calorific value, as well as in quantity delivered per hour, would be possible. Generally speaking, however, guarantees would be required covering the following points:

1.—*Quantity of Gas to be Supplied and Accepted per Hour, Day, or Week*, with in some cases special arrangements as to gas supplied during week ends and holidays, when many of the processes associated with collieries and coke-ovens are stopped—thus rendering available a larger quantity of surplus gas from the ovens, which must always remain at work.

2.—*The Pressure at which the Gas should be Supplied.*—In most cases, it would probably be found best to deliver the gas at such pressure as would be ample to fill the gasholders at the gas-works. The initial pressure at the coke-ovens would then depend on the pressure required for this purpose, and on the size and length of the supplying mains.

3.—*Quantities of Impurities.*—Where purified gas is supplied—and this appears to be indicated in most cases—absolute freedom from sulphuretted hydrogen is essential. But possibly a little latitude in respect of naphthalene and ammonia would be permitted. A gas containing not more than 4 grains of the former and 0·5 grain of the latter per 100 c.ft. would no doubt be required and supplied. As to sulphur compounds, no difficulty in conforming to the usual standards need be apprehended, since, arising out of the use of a washed fuel, coke-oven gas usually contains less carbon disulphide than gas from gas-works. As to the quantity of inert constituents permitted in coke-oven gas, if the calorific values are fully maintained, it is difficult to see the utility of limiting these unnecessary constituents of gas; but in the interests of both seller and purchaser, they should be reduced to the lowest limits all-round economy will allow.

4.—*Calorific and Illuminating Value.*—Minimum, and in some cases maximum, values may be stipulated. Probably a gross calorific value of 500 B.Th.U. would be found to be most satisfactory to both parties, having regard to the price of such quality in comparison with gas of higher value. Some latitude of (say) 50 B.Th.U. above or below this figure should be allowed. As to illuminating power, it is difficult to see what advantages would be gained by the inclusion of complicated stipulations relating to candle power; and it is hoped such would be found to be quite unnecessary.

5.—*Payment.*—Probably a sliding-scale system of payment, recognizing the principle that it is the number of heat units that is to be paid for would be found to be most satisfactory. It might be advisable also to embody in such a system a clause permitting a larger volume of gas to be delivered at certain periods, week ends, &c., for which a lower price might be accepted. This might be advantageous to both industries, in so far as it would dispense with the need of labour at gas-works during week ends, for which extra payment has to be made, and as it permits of the supply of a larger quantity of gas at those times when the consumption of gas at coke-ovens and collieries is least. It is difficult, and almost unnecessary, to lay down an opinion as to the value of a purified coke-oven gas to gas concerns; but having regard to the published costs of manufacture of gas at gas-works, it would appear that such works would be the gainers if they could purchase suitable gas at a price after the order of 1s. 6d. per 1000 c.ft.

Mr. Hollingworth, concluding, said he had dealt with this important and complicated subject in a very general manner indeed—first, with the principal object of drawing the attention of gas supply authorities to the position. In the discussion, he hoped the speakers, in the interests of the industry, would take up the same attitude—that was to say, that they would endeavour to present before the gas supply authorities the huge possibilities of taking gas in bulk from coking plants. He was not there to endeavour to at all assist the individual members of the Midland Section, but rather to take the very much larger view of endeavouring to assist the whole coking industry. This explained the extraordinary lack of detail in the address. He would like to put before the meeting the point of view of the coking industry with respect to the great schemes of centralized supply of heat, light, and power now being considered by various committees and associations. The fascination which electrical schemes seemed to have—naturally to electrical engineers, but not so easily understood in regard to the general public—was fast driving the Government of this country into extremely costly ventures of supply which, in his opinion, were not at all justified. In this connection, he would like to direct attention to the lecture by Sir Dugald Clerk, at the Society of Arts the previous week, in which he had said it would be the greatest mistake imaginable to set up new centres of supply which would take for their object the supply of electric light and heating by the burning of coal under boilers. He was sure his hearers would agree that, as an industry and as individuals, the coking engineers were all deeply interested in this question; and as members of such an important industry it was their duty to see that, wherever possible, the gas which they generated, and of which the best was not now being made, should in any such national scheme be made the fullest possible use of.

YORKSHIRE JUNIOR GAS ASSOCIATION.

A Meeting of the Yorkshire Junior Gas Association was held last Saturday week, at the Gas Committee rooms of the Halifax Corporation. The President (Mr. E. L. Oughton, of Longwood) occupied the chair.

The members were welcomed by Mr. W. B. M'Lusky (Gas Engineer to the Halifax Corporation), on behalf of the Committee. He said he was glad to have the opportunity of spending an afternoon with the juniors. As a matter of fact they were all juniors alike in the matter of experience and knowledge, whatever institution they belonged to, and were learning every day. Those who were not doing this, were victims of that unfortunate disease known as "swelled head." Gas engineers had had a severe testing time during the past four-and-a-half years of war, while the boys had been doing their bit at the front. They had many times almost had to face the great problem of the meeting of the immovable mass on the one hand and the irresistible force on the other. When this occurred, one had to choose. They had been stripping the gas until they had not 15 oz. in the pound left; and they had been obliged to sell it as 16 oz. to the pound. When they had been asked the reason why, they dared not say. They had been short of coal; and the coal they had secured had had about 4 cwt. of clinker to the ton. He mentioned these among their difficulties, not by way of complaint, but as a means of encouragement for the future, because what they had done under the strain of the war period, gave hope for the maintenance of efficiency in their undertakings in peace times; and by profiting from the lessons of the war, they might become better servants of their undertakings, and better citizens of the community.

The President said the members appreciated the welcome given by Mr. M'Lusky, and the kindness of the Gas Committee in allowing the members the room for the meeting and the facilities for the inspection of the plant. They all hoped they would have learned something by their attendance, and would be able to help one another by speaking of their own experiences.

Mr. F. Pykett (Halifax) then read the following paper.

THE GROUP OR DUCT SYSTEM OF LIGHTING.

In submitting this paper, I trust you will not be under the impression that it is in any way what may be termed "trade puff," or that I am boosting this system of lighting to the detriment of all or any other. I simply wish to give a plain description of the fitting-up of the installation, and remark upon any advantages, disadvantages, or peculiarities I have found whereby it differs from other methods. At present, in Halifax we have only two installations—one at the gas-works, and the one of which I am about to speak.

Having personally been successful in obtaining orders for the lighting of several workshops and mills in town, I can safely say that I hold no brief for one system over another, unless that system is specially adapted for one certain kind of work or business. The installation in question is fitted in a cotton spinning mill comprised of ten floors. The lower five floors were lit by electricity; the upper five by flat-flame gas-burners fitted on ordinary double and single arm pendants in rows of 9 to 14—the number varying according to the length of the mill. Altogether there were 190 2-light and 84 1-light pendants—464 burners in all. The lighting was totally inadequate; and the incandescent system was recommended. The question that arose was, what type of burner would be most suitable to adopt, having regard to the abnormal amount of light fluff and dust in suspension, despite the fans used to ventilate the room. After careful consideration, the duct and group system of lighting was selected; all the air required for combustion being drawn from the outside. This system appealed to the proprietors, as they had experienced difficulty with fluff in earlier installations of incandescent gas lighting in their other ordinary mills.

To demonstrate the suitability of the system, it was decided that twelve 300 c.p. lamps should be fixed on approval. These were to take the place of twelve 2-light pendants. They were fitted in the top room—a small compressor from stock being used. The installation proved a success from the start, and the lighting of the whole of the upper five floors was proceeded with at once. The 300 c.p. lamps took the place of the double-arm pendants, and the 150 c.p. lamps displaced the single-arm pendants. The existing points were found to be quite suitable, with the exception that in two rooms one row of pendants was entirely dispensed with. The total number of incandescent lamps fixed was 179 of 300 c.p., and 74 of 150 c.p.

A Keith "C" size rotary belt-driven compressor, complete with return governor valve, pressure oil feed, fast and loose pulleys, capable of discharging 2000 c.ft. per hour at 80 in. water column, was fixed on the sixth floor (the lowest of the gas-lighted rooms) near to the 4-in. cast-iron existing low-pressure trunk gas-main. This main runs vertically from the bottom to the top floor. A 4-in. maleable iron strengthening clip, with a 2-in. outlet, was connected to this trunk main; a 2-in. hole bored in the main; and a connection made to the inlet of the compressor with a 2-in. wrought-iron tube. A 2-in. control cock was fitted to the inlet pipe. A 2-in. wrought-iron trunk high-pressure main was run vertically at the side of the existing low-pressure main from the sixth floor to the top one. The end of this main rests on the floor of the sixth room, and 2 in. by 1 in. tees were left, and 1 in. high-pressure gland cocks, which allowed individual control to each room. The outlet of the compressor is connected into this trunk supply pipe about 2 ft. from the base (the connection being more easily made at this height); and the length of piping below forms a small reservoir for any oil that may be thrown forward from the compressor.

A description of one floor will be sufficient; the principle being the same throughout. The only difference was in the arrangement of the burners, varied to suit the work carried out in the different rooms, and in accordance with the position of the machinery. Whereas with ordinary high or low pressure lighting, one set of pipes is sufficient, in this system it is necessary to have three distinct and separate sets of pipes—namely, one pipe charged and supplying high-pressure gas, one carrying the air for mixing with the gas to the injector, and one supplying the mixture of gas and air from the injector to the burners. The principle upon which the system is designed is that, in place of each individual burner having a gas injector and air intake, one injector is utilized to supply any number of burners varying from three to seven. It can be arranged for the air either to be drawn in at the injector itself or through the pipe or duct connected to it from the outside. The mixture of gas and air is then carried forward from the injector to the several burners.

Having previously decided that the existing points [see fig. 1] would be suitable, it will be seen that the gas supply pipes could, with very little alteration, be used to carry the mixture of gas and air. The trunk supply feeding the four 1-in. pipe lines, together with the cross pieces, was entirely taken out; the lines being connected again, and each one becoming separate and distinct from the others.

These four lines were again divided [see fig. 2] into two sections; each with from five to seven points. Tees were inserted approximately in the centre of the eight sections, to which the injectors were connected with 3-ft. lengths of piping. It was considered more likely that an even distribution of the mixture to the lamps would be secured by this method than by fitting the injector direct on to the tee. The 2-in. wrought-iron air-ducts were run diagonally to these sections across the rooms, through the window frame, to the outside. To this end of each was attached a copper gauze. The pipes were fixed about 2 ft. away from the injectors—thus allowing sufficient room for a connection to be made to each of the 2 in. by 1 in. tees that were left opposite each injector.

A 1-in. high-pressure gas supply pipe was now taken from the control cock down the room to the far set of injectors; and two ¾-in. supplies were led off from this supply pipe across the room near to, and parallel with, the air-ducts. Tees were left at suitable points near the injectors, into which were fixed screw-down high-pressure gas-cocks; a connection being made from these to the injector by means of ¼-in. solid-drawn copper tube. The length of ¼-in. pipe was made as short as possible. The roofing being arched concrete, strong suitable clips to hold the air-duct as well as the 1-in. high-pressure gas-pipes were made to fit on to the H girders that supported the floors.

The lamps consist of a wrought-iron and flexible drop stem, and a light square riveted frame into which fit the four opal panes of reflecting glass. The frame is held in position at the end of the iron stem by means of the superheater. The lamps are screwed into the mixture pipes at the existing points. Ordinary 300 c.p. size and type of high-pressure gas mantles are used, and burned off in the usual manner.

Owing to the inability to secure a Class A certificate for the materials, the commencement of the 1917 lighting season was drawing near before everything was ready for trial. It was also necessary to carry out the major portion of the work during the week-ends. The compressor gave no trouble at all, and worked quite satisfactorily from the commencement. The whole of the joints and connections in the high-pressure supply pipes were charged-up to 5 lbs. pressure and tested by painting with oil. The working pressure is 3 lbs. It was not necessary to test any of the other pipe lines; there being no pressure in the air-duct, and slightly under ½ in. water-column in the mixture pipes.

The principle of the adjustment of the injector is similar to that of a Keith high-pressure lamp. The first adjustments to the injectors were established without difficulty, with the following exceptions: Certain sections of burners, on being extinguished, lit-back to the injector, and the explosion in the mixture pipe caused all the mantles on these sections to burst. It was discovered that the trouble arose from:

A.—Two injectors had been connected from tees on the air duct, as shown in fig. 3. This caused both sections connected to this one tee to light-back. When both were supplied separately from the duct, the trouble was overcome.

B.—Another section to give the same trouble was one of the six 150 c.p. lamps in a corner of the top room, which necessitated a considerable length of 1 in. pipe from the 2 in. duct. To this section an injector was fitted, which took the air in at the injector itself, and not from the duct. This overcame the difficulty.

We received a complaint about two weeks after commencing, to the effect that certain sections of burners were burning with a white flame and giving a poor light. This became more noticeable after burning some time, which explained the reason why the

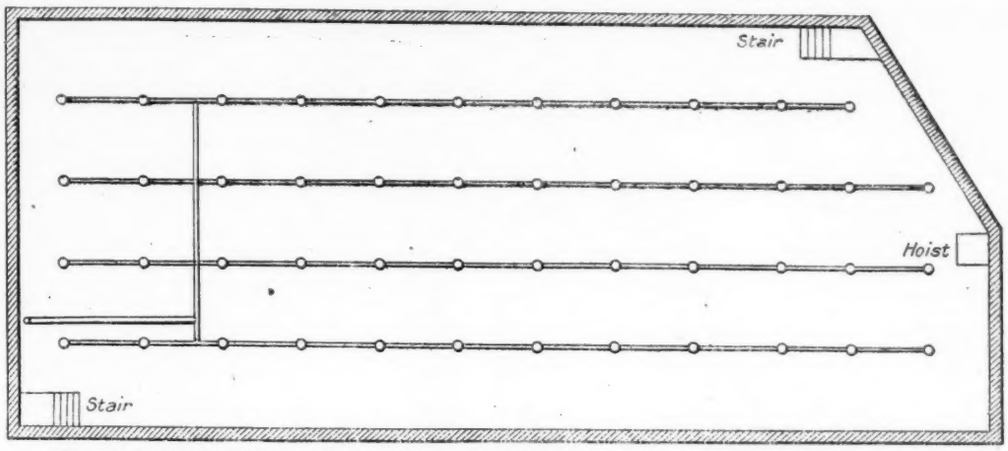


Fig. 1.—PLAN OF THE VENTH FLOOR, SHOWING THE ORIGINAL LOW-PRESSURE PIPES.

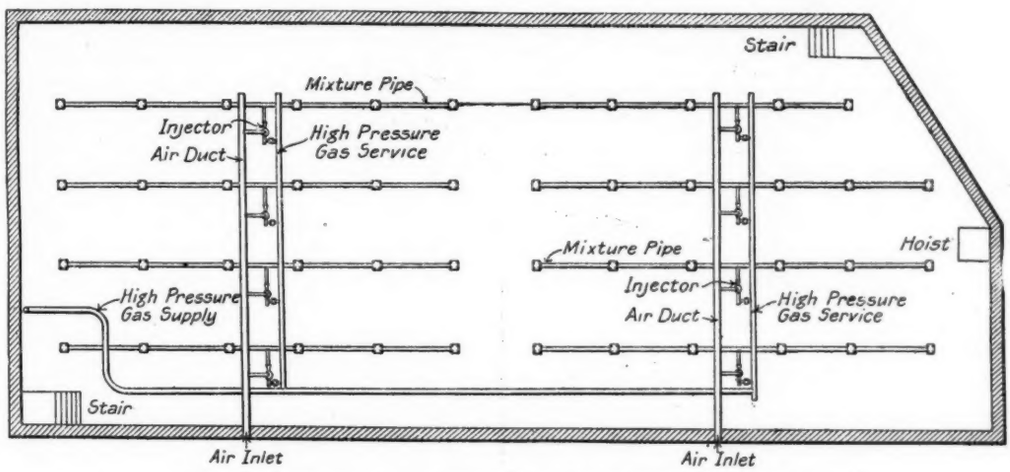


Fig. 2.—THE NEW ARRANGEMENT OF HIGH-PRESSURE PIPES.

complaint was not received earlier—namely, that the lights were being required now for a longer time. These sections were found to be sets of 150 c.p. lamps which had the air supply taken from each end of the 2 in. ducts. Thinking that there would be some slight pull shown on the main duct, I had this tapped, and a gauze fixed at various positions on the whole length. No pull whatever was shown; a level gauze being maintained at all positions. Smaller gas nipples were fitted at the injectors; but this made no improvement. The larger injectors taken from the centre of the duct apparently were not allowing the air to get to the first and

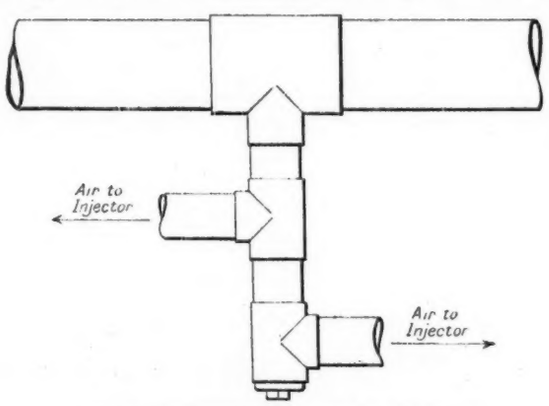


Fig. 3.—The Connection for the Two Injectors.

last two rows of burners, as these burned quite satisfactorily when no other burners were lighted. By opening the other end of the 2 in. duct an improvement was effected which proved quite satisfactory. To this open end a gauze was attached, to prevent fluff being drawn in; the intention being to extend the pipe to the outside at a later date.

Before we carried out this alteration, a telephone message came one morning to say that the whole of the lighting was failing. Upon arriving, a glance was given to the compressor; but a steady pressure was being maintained on the outlet. On passing up to the seventh floor, it was seen that there was a considerable shortage of air throughout the whole system. Practically, all the burners were found burning with a luminous flame through the mantle. Upon inquiring, it was found that this had been so very soon after lighting. The trouble was, obviously, that the gauze was made-up at the end of the duct. Up to this time the gauzes had lasted a week comfortably without being cleaned. Upon examination, it was found that a film of moisture had formed on the gauze, to which had adhered a considerable amount of dust thrown out of the room by the ventilating fans. The gauzes were cleaned; but after about twenty minutes, failure was again observed. The easiest way to overcome the trouble was to shorten the pipe, and leave the gauze just inside the window. This proved quite satisfactory, although the principle of the air being drawn from the outside of the building is not exactly carried out. The only alternative would have been to fit gauzes of larger mesh, which probably would have allowed fine dust, &c., to be drawn into the duct, or to fit some kind of hood or cowl over the end of the pipes, which protection, while preventing dirt and fluff, &c., being drawn in, would have little, if any, effect in preventing moisture settling again on another misty day.

The gauzes at the end of the ducts were first made conical, and soldered into an ordinary 2 in. barrel nipple—screwed in by hand only. The open area was equal to the area of the 2 in. pipe. Distortion took place owing to the air being drawn through the gauze when it was partially made-up; and so gauzes were fitted to both ends of all the ducts. These are made cylindrical in shape, and have since had strengthening wires soldered on. By having both ends open, a freer access of air is obtained at the injectors.

The chief advantage of the system is the low maintenance cost, especially in the renewal of mantles, glass, &c., together with adaptability to mills and shops, foundries, &c., wherein similar conditions prevail. An estimate of £40 per annum was given for the maintenance work, which includes all labour, renewals, &c. This work is usually carried out on Saturday mornings by two men and a youth. All the lamps are dusted with feather brushes, and the air-gauzes cleaned. It has not been necessary to make any further adjustments to the gas supply or air regulators. The cleaning of the two gauzes on each air-duct is all that is necessary to ensure a good light from 24 to 36 burners; whereas, with individual burners, it would be necessary to clean each individual gauze. In this case, such work could only be done when the machinery is not in motion; whereas at present the dusting can

be done while the machinery is working. As a prevention against fire, glass bottoms were fitted to the lamps, during the first lighting season; but these have since been removed. The maintenance of the glass was high, and they were found unsuitable. The workpeople complained of small particles of broken glass cutting their feet while walking underneath the lamps, after a pane had been broken and the damaged glass taken away. The lamps are now being fitted with larger covering plates on the top, to prevent any falling fluff from passing the mantle and firing.

The following statement shows the materials used and the cost of maintenance. The reduction in glass is noticeable this year. Last year the amount of glass in use was, of course, double; and when mantles became in the least damaged, the bottom glasses usually suffered. This year includes last Saturday's time and materials. The lamps are not used after April.

	Mantles. (300 c.p.)	Mantles. (150 c.p.)	Glass Tops.	Glass Bottoms.	Labour Costs. £ s. d.	Material. £ s. d.
1917–18 . .	456 ..	213 ..	60 ..	127 ..	16 6 8 ..	21 4 3
1918–19 . .	140 ..	68 ..	38 ..	— ..	24 6 8 ..	12 12 9

The chief disadvantage is that it is necessary to have all the burners off one injector lit together; and if it is required to have one or two individual lights (say, in an office or staircase) it is advisable to take these off the low or high pressure supply and fix ordinary burners. I am of the opinion also that the high initial cost is one disadvantage, especially where it would be necessary to lay new pipes to carry forward to the lamps the mixture of gas and air. In the present instance, existing pipes were conveniently utilized; but some 700 ft. of 2 in. wrought-iron pipe were used, and 1200 ft. of high-pressure gas supply pipe, together with some 850 various wrought-iron fittings.

Had it been necessary to relay the mixture pipes, some 2000 ft. of pipe would have been required, and 250 additional fittings. This, together with the extra labour required, would have inflated the initial cost of the scheme. The estimate given for the work was £365; and the actual cost was £338.

From tests made, the estimated consumption of gas per hour with flat-flame lighting was 3712 c.ft.; at present, it is 1878 c.ft. A saving of 1834 c.ft. per hour is thus effected.

DISCUSSION.

After the reading of the paper, the party adjourned to the workshop, where they inspected in operation an installation similar to that described in the paper—the workshop itself being an old silk mill.

Mr. Charles Roper (Bradford) asked if the method of lighting-up was by hand in the ordinary way. Receiving a reply that this was so, Mr. Roper said he supposed the compressor was run off the mill's ordinary shafting. In that case, what was done when the mill engine stopped?

Mr. Pykett said the proprietors of the mill had put in a small steam-engine to meet this need. The lights were sometimes required before the mill started work. When the main engine was working, the belting was switched-off the small engine on to the ordinary shafting.

Mr. Roper remarked that Mr. Pykett had said he did not test the mixture pipes for pressure. He wondered why, and asked in what condition the fittings were found when they were put in.

Mr. Pykett said it had hardly been thought necessary to test the mixture pipes, because the pressure in them was only ½ in.

Mr. Roper asked what had become of the 80 in. water pressure on the gas.

Mr. Pykett said it was all lost in the area. They had 50 c.ft. of gas passing through the nipple; and it would be drawing a certain volume of air, and there would be nothing like 80 in. pressure then.

Mr. M'Lusky remarked that the injector was mechanical—it was a means to an end.

Mr. Roper: By means of the high pressure one obtained an effective mixture?

Mr. Pykett: You would get the mixture carried forward if you had only low-pressure gas at the nipple.

Mr. Roper observed that recently, in the public Press, there had been several letters about the danger in mills from falling mantles. He thought there had been an example given showing it was not so much the falling mantle which was the danger as the falling ring.

Mr. Pykett said the chief danger against which his department took preventive measures was that of the firing of the fluff of the mills by falling past the mantle. They had had no trouble with falling rings; but the workers had been instructed that if the rings got split at all the mantle had better be removed and replaced. No doubt the mantle would hold on by the binding, even with a split ring; but it was considered much safer to dispense with the mantle immediately. If a mantle fell, he supposed it would be cool by the time it reached the floor. But the ring would not; and if the ring fell on the fluff it would fire.

Mr. P. M'Nab (Oakenshaw) asked if the lamps were the Gas Department's own make?

Mr. Pykett replied that they were all Keith lamps; but the glass bottoms he had mentioned had been an addition of their own.

Mr. E. S. Garsed (Elland) remarked that the cost of renewals of mantles was apparently very low, which was a good recommendation. He took it some of them had served the second season.

Mr. Pykett said that was so. He was a great believer in using the mantle made by the maker of the lamp.

In answer to a question as to whether the high-pressure gas lighting was cheaper than an electricity installation, taking everything into consideration,

Mr. Pykett said it was decidedly so.

Mr. M'Lusky said he had had the privilege of being present at a meeting of electricity and gas engineers, at the Society of Arts, at which it was shown that the relative lighting efficiency in gas-burners was 35 p.ct. and in the electric half-watt lamp 38 p.ct. The gas was beaten in this respect for the first time in 27 years. But it was not beaten in regard to cost; and the price was a very material consideration in the question of efficiency. On the question of cost, high-pressure gas would beat electricity even if the super-power stations realized all that was claimed for them. At the same time, the gas industry must improve the ordinary burner to overtake the start gained in relative efficiency by electricity at the present moment. The electric people had still to overtake the gas industry on cost.

Mr. Heathcote (Halifax) did not think that they need be unduly alarmed about the half-watt lamp—indeed, he did not think it was really a half-watt lamp. But apart from this, they were in very high power units. For purposes of even distribution of lighting in factories, he did not think these high-power lamps would be much applied. It was not a comfortable light to work under. The only way to get any comfort would be to shade the lamp; and this, of course, reduced the efficiency. In the electric lamp there were a lot of rays very harmful to people working under them—there was a very severe eye-strain which was not conducive to good work.

Mr. M'Lusky said his experience suggested that when the customer renewed one electric lamp he discovered the great deterioration of the others. He did not think the gas-mantle deteriorated to anything like the same extent. There was no visible deterioration after nine months' use of a reputable mantle.

The President remarked that this was the great drawback to factory electric lighting; there were bright spots and dull spots.

Mr. M'Lusky said at the same time he thought they ought to stick to small burners—No. 2, and no larger—for durability and efficiency. The flame of the small No. 2 burner was a perfect short flame.

The President said whatever they might think about the system described on the paper, they had been able to see, by the installation at the works, that it gave good results. He wondered whether the author could give any information as to the maximum length of the tube which could be used.

Mr. Pykett said they had got the air-duct in near as possible off the injectors. The length which had caused trouble had been about 20 ft. away; and there were three bends, which might have had something to do with the trouble. If one could get the injector fed direct off the duct, with just one bend, there would be no trouble whatever length was used. In answer to a further question, he said in making the installation they had not calculated what would be the cost if it had had to be an entirely new equipment in the mill, because, with the stuff mentioned coming in conveniently, they had not had any reason to consider this aspect.

Votes of Thanks.

On the motion of Mr. F. Clegg (Huddersfield), seconded by Mr. Garsed, a vote of thanks to the Gas Committee and to Mr. M'Lusky was passed.

Mr. M'Lusky, in responding, said it had been a pleasure to give the facilities and the information. At the meeting in London to which he had referred, the relative efficiencies of gas and electricity had been stated for lighting at 35 p.ct. for gas and 38 p.ct. for electricity—again for the latter. For heating, gas was as 4·34 p.ct. to 1 p ct.; and for power, 11 p.ct. for gas and 6·8 p.ct. for electricity. So gas gained in these respects.

Mr. P. M'Nab, in moving a vote of thanks to Mr. Pykett, said the author of the paper was to be congratulated not only on his communication and on the success of the installation described, but upon the fact that the cost of the latter had been under the estimate.

The motion was seconded by Mr. Crowther (Heckmondwike).

A Welcome to Members from the Forces.

The President, before closing the meeting, welcomed the return of several members who had been absent in the Forces, including the Senior Vice-President, Mr. J. M'Lusky, who would have been President this year but for his absence answering the call of his country.

Cleaning Old Cookers, &c., by Sand Blast.

During the visit the party were enabled to witness in operation the sand-blast plant for cleaning old cookers, fires, &c. Mr. Pykett explained that the two principal elements in the process were air and sand—just ordinary sand, not too fine and not too coarse. Power was supplied by a gas-engine, and the pressure was got up by an ordinary vertical pump, which passed air to the receiving cylinder up to about 15 lbs. pressure. The air was taken from the cylinder to the mixer, and mixed with the sand. The article to be cleaned was placed on a round table, which could be revolved. The sand trickled through a perforated plate and was carried back again through the plant into the mixer. The fine dust was drawn up a flue and through a fan to the outside. Some fine dust, of course, collected in the chamber; and there was a fan for drawing the dust away. The process involved a gradual loss of a little sand; but the bulk of it could be used over and over again. Up to the present, stoving of the cleaned apparatus had not been done. This process was intended to be added.

Industrial Reconstruction and the Metric System.—Urging that the necessary expansion of our export trade, coupled with the imminent establishment of new industries and of new standards in old industries, calls for a reconsideration of the claims of the international metric system as the universal language of quantity, the Decimal Association have reprinted in pamphlet form an article by Mr. Harry Allcock, entitled "Industrial Reconstruction and the Metric System." Considering first of all the arguments in favour of the system, the author then goes on to discuss one by one the principal objections to its adoption which have hitherto been advanced. It is suggested that the Government should forthwith announce that, having regard to their desire to simplify education, to assist in the re-establishment of British industries on a scientific basis, and to promote the development of the British export trade, they will encourage the more widespread use of the international metric system, and generally prepare the way for the complete change-over to it. The steps which might be taken to this end are detailed.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Prof. Bone and the Thermal Efficiency of Electric Power Stations.

Sir,—In the report of Prof. Bone's interesting third Cantor Lecture on "Coal and Its Conservation," I note a statement from the lecturer that Sir Dugald Clerk last week, and I in the current number of the "Edinburgh Review," have said that the best electric power station is working with only 13 p.ct. thermal efficiency, while Prof. Bone "is informed on good authority" that the actual coal consumption at one of the largest power stations in this country corresponds with nearly 17½ p.ct. efficiency, and "it is confidently anticipated" that in a super-station which is now in course of erection quite 20 p.ct. efficiency will be attained.

It is difficult to deal with isolated results and anticipations; but it is desirable to point out the nature of the figures used by Sir Dugald Clerk and myself. Sir Dugald Clerk, as I understand, was dealing with the best published returns for a year's working of any electrical undertaking in the country. My own figure of 13 p.ct. was not a statement of what any power-station had done or could do, but was derived directly from the reduction from 5 lbs. to 1½ lbs. of coal per horse-power-hour, which the Coal Conservation Committee used in their own calculations and estimates of prospective economies. Since the best figures attained for a year's working by any undertaking have not exceeded this figure, but, allowing for distribution, have come below it, the estimate did not err on the side of modesty. But I accepted it for the purpose of my article as being a figure which the Coal Conservation Committee could, at any rate, not call into question.

It may, however, be pointed out that the results of the comparison I made would remain substantially the same, even if the very exceptional and speculative results quoted by Prof. Bone came to represent normal achievement. It is suggestive of the real position that Prof. Bone described the statement made above as an answer to the whole of the criticism on the thermal basis.

John W. Cobb.

The University, Leeds, March 29, 1919.

Thermal Efficiency v. Cost.

Sir,—In advocating the advantages of the distribution of gas, we must not allow our adherence to the fetish of thermal efficiency to blind us to the cost factor. The public and the householder require cheap thermal units; and if the householder is keen enough to take an interest in such matters, he can easily calculate that, in spite of present prices, the coal merchant can deliver about 50,000 B.Th.U. at his house for 1d. (with coal at 46s. 6d. a ton), whereas the gas company only supply 10,000 B.Th.U. for the same money (with gas at 4s. 2d.). This allows a very big margin indeed for the inefficiency of the coal-fire.

Taking my own case as an example. One room required about 24 lbs. of coal per day, at a cost (including firewood) of 6½d. To get the same service—*i.e.*, maintain the same degree of comfort for a similar number of hours—I find the gas consumption is 250 c.ft., costing about 1s. 1d., or exactly double. This is after making an allowance for the time taken by coal to get the room to a fair temperature.

On this basis, it appears that the gas-fire has an efficiency 2½ times as great as the coal-fire in my particular case; but I cannot because of this recommend a neighbour to make the exchange on the ground of economy.

We must further improve our carbonizing, and our gas-consuming apparatus, and compete on the price question, when the many advantages of gaseous firing will convince the most sceptical.

G. E.

March 29, 1919.

Salaries in the Gas Industry.

Sir,—"Anonymous," in his letter concerning the above subject, has opened-up a new sphere of usefulness, in so far as the staffs connected with the gas industry are concerned. An Association or Union would supply a long-felt want for a class who have in many instances, as regards salary, been sadly neglected by the administrators of our industry—during the past few years especially.

Has this neglect been through members of the staff not being combined in a proper manner? I am afraid the answer must be in the affirmative, and that the administrators have taken advantage of the fact. I trust your article will be the means of a united response in the manner you mentioned.

I would suggest that "Anonymous" (if the replies warrant such a course) call a meeting at an early date—say, at Caxton Hall. Once get the project started strongly, I am confident there will not be many laggards to "whip in." But, as you very aptly state, the whole scheme must be of a unanimous nature. Otherwise, it would not carry weight; and the whole object would be defeated.

It may be of interest to know that the Electrical Officials Association (now registered as a Trade Union) secured the 12½ p.ct. on their gross salaries for their members from the engineer down to the office boy. There is no reason why we cannot do likewise, and gain other favourable considerations, of a higher standard in proportion than those secured by the workmen.

Discontented.

March 28, 1919.

Sir,—Your correspondent does well to throw the searchlight on the Mossley appointment.

In pre-war days some local authorities were guilty of foolish parsimony where salaries were concerned, and in the matter of workmen's wages, too. I am not sure that it would be unfair to say that some gas managers were as keen as the representatives of the much-dreaded ratepayers on keeping wages down; and such a policy it seems to me was a mistaken one, even in those days. But the policy has been continued through the war period. Workmen's demands have been resisted all along the line. Twelve months ago, at a meeting prior to the arbitration which took place on March 21, there was a motion from one quarter—"that we absolutely refuse, &c." It would appear to me that if the gas manager argues against war bonuses for his workmen, he provides an excuse—if not a reason—for the municipal authorities not dealing with their gas managers equitably.

The gas manager interests himself earnestly in the formation of a National Gas Council and an Employers' Committee; but he has not shown equal eagerness to establish a Gas Managers' Salaries Committee in connection with his Institution. Ought he, therefore, to grumble at anyone but himself if his salary is inadequate? If he ought, should he not grumble at himself first?

I am a member of the National Association of Local Government Officers, and have had 29s. per week increase on my pre-war salary (exclusive of all merit increases), because I am a member of the Association. I would advise all municipal officials to "join up." The Association is doing valuable propaganda work in connection with superannuation. This in itself is a sufficient reason why all municipal gas managers should enrol.

Nalgonian.

March 27, 1919.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The opposition to the Hartlepool Gas and Water Bill and the Sunderland Gas Bill has been withdrawn; and the Bills have been committed to the Unopposed Bills Committee.

The Brentford Gas Bill was reported from the Select Committee, with amendments.

HOUSE OF COMMONS.

Progress of Bills.

The opposition to the Northampton Gas Bill and the Stocksbridge Gas Bill has been withdrawn. The two Bills are among the measures which have been referred to the following Committee on Unopposed Bills, to meet on Thursday: The Chairman of Ways and Means, the Deputy-Chairman, Mr. France, Sir John M'Callum, Mr. Thomas-Stanford, and Mr. Moon.

Electrical Power Report.

Mr. Bonar Law, replying to questions by Mr. Wilson-Fox, said that a report had been submitted by the Ministry of Reconstruction to the War Cabinet dealing with the proposals for the reconstitution of the electrical power system of the country. The report would be laid before Parliament as soon as it could be printed.

Benzol Extraction from, and Inerts in, Gas.

Mr. Joynson-Hicks asked the President of the Board of Trade: (1) Whether, having regard to the importance of home-produced fuel as a means of rendering motor transport independent of imported petrol, he would give every encouragement to gas companies to continue and expand the practice of oil-scrubbing for benzol by all gas undertakings. (2) Whether he was aware that the quality of gas supplied in London during the war was due to the presence of incombustibles in the gas, and not to the extraction of benzol, as suggested by certain authorities, and that many Provincial gas undertakings that had fully extracted benzol during the war had nevertheless kept above the statutory standard of 500 B.Th.U.

Mr. Bridgeman replied that some time ago the Fuel Research Board were asked to advise upon the question of what was the most suitable quality and composition of gas and the minimum pressure at which it should generally be supplied, having regard to the desirability of economy in the use of coal, the adequate recovery of bye-products, and the purposes for which gas was now used. Their report had been received; but until the Board of Trade and other Departments concerned had had an opportunity of considering it, he was not prepared to express an opinion on the matters referred to by Mr. Joynson-Hicks.

Marketing of Benzol and Other Motor Spirit.

Mr. Sexton asked the Minister for Reconstruction if he was aware that an attempt was being made to corner the petrol supply, and that, in addition, the petrol ring had also cornered home-produced benzol, with the object of keeping up the price of motor spirit; and, if so, and in view of the urgent necessity of cheap transit, it was his intention to apply for similar powers of control contemplated by him under the Ministry of Ways and Communications Bill as regards the control of electricity.

Mr. Bridgeman, who replied, said his attention had been called to a report of the amalgamation of two of the large companies who deal in motor spirit; but he did not understand that there was danger of a corner in petrol. The petrol importing companies had been marketing certain quantities of benzol; but there was no corner in this product, and it was hoped that a large proportion of the output would eventually be distributed by the producers. A scheme for carrying out such distribution was under consideration. In these circumstances, action in the direction contemplated in the last portion of the question did not seem to be necessary.

BRENTFORD GAS BILL.

HOUSE OF LORDS COMMITTEE.—Wednesday, March 26.

(Before the *Marquis of* Bath, *Chairman*, *Marquis of* Linlithgow, *Lord* Leigh, *Earl* Eldon, and *Earl* Malmesbury.)

This Bill, promoted by the Brentford Gas Company, proposes to use further lands for gas manufacture and storage, and also to raise additional capital.

Counsel for the Bill were Mr. Honoratus Lloyd, K.C., Mr. H. Talbot, K.C., the Hon. Evan Charteris, and Mr. Robertson (appearing for Mr. F. S. Baker, with the Forces). The Southall Urban District Council were represented by Mr. Clode, K.C., and Mr. Jeeves.

Mr. Honoratus Lloyd, in opening, said the Bill was promoted by the Brentford Gas Company. It had already passed the House of Commons last session, and had been carried over from the last Parliament. The Bill enabled the Company to raise further capital, and to utilize land for the manufacture and storage of gas. During the past four or five years gas companies had not been able to do much in the way of making the necessary extensions to keep pace with the demand, for the simple reason that they had not been able to get labour and materials. He would not have to trouble the Committee at any length, because most of the proposals were unopposed; the only opponent being the Southall Urban District Council. The district supplied by the Company was a large one. In 1913, there was a pressing necessity to provide further works; and in 1914 a Bill was introduced for powers to take a site in what was known as the Chiswick bend of the River Thames—that being a site which appeared to the advisers of the Company to be an excellent one for the purpose, and one which would enable gas to be manufactured more cheaply, and consequently supplied to the consumer at a lower price. The scheme, however, was not a popular one; and the Bill was rejected. Then came the war; and the demand for gas increased abnormally. The Company had to strain its coal-gas plant to the extreme, and also had to make full use of its water-gas plant. The increase, however, went on; and in 1918 the Company again came with a Bill for the Chiswick site. But this proposal was unpopular; and in order to get a second reading for the Bill, the idea was abandoned—the Company deciding to concentrate upon the existing site at Southall, which was authorized in 1881. This site consisted of 80 acres; and 40 acres were at present utilized for the purpose of gas manufacture and storage. The Bill asked for power to use portions of the land for gas manufacture and storage which were not now used for these purposes.

Mr. Clode said that his only objection was to the portion of land on the London side of the site, close to Southall Station.

Mr. Honoratus Lloyd said this piece of land at present was used mainly as a recreation ground for the staff. There were certain works upon it, including a governor house; and it was a little unfair that the local authority should now come and say that a site authorized in 1881 for the general purposes of a gas company was not suitable for gas manufacture. The petition of the Urban District Council said that the nuisance created by the works would be deleterious to the health of the population, and would depreciate the value of the neighbouring property. As a matter of fact, all the houses around the works had been built since the works were put up. It was a singular thing that whenever gas-works were erected houses were built all round them. Moreover, in the last House the Council did not mention the question of nuisance from gas manufacture. They opposed on the question of interference to a road, and also because they said they had a town-planning scheme. Further, they now said the works would interfere with a proposed dust destructor, which certainly would not add to the amenities of the district.

Mr. Clode: That is no part of my case.

Mr. Honoratus Lloyd said notice had been given to all occupiers within the 300 yards area, and there was not a single dissentient.

Mr. *A. A. Johnston*, the Engineer and Manager of the Brentford Gas Company, said that the output in 1903 was 2000 million c.ft.; in 1912, it was 3000 millions; in 1916, 4000 millions; while in 1917, there was the extraordinary increase of 500 millions. The Southall works supplied two-thirds of the total output of the Company, as there was not one inch of space at the Brentford works.

In cross-examination by Mr. Clode, witness said if the 14 acres of land at the other end of the works at Southall was made use of first, it would block access to the portion which it was proposed to use, and which was opposed. On the question of nuisance, it came out in the cross-examination that the Company would be liable under the common law for any nuisance, apart from special powers in the Bill.

Mr. *W. Doig Gibb* agreed that the site to the west of the works was essentially one for the laying of sidings and arrangement of facilities for coal and coke storage. It would be absurd to put works on this portion of the available land. Moreover, the whole of the land to the west was occupied with coal and coke stores and buildings.

In his cross-examination, Mr. Clode put it that the Company had, adjoining the recreation ground now proposed to be used, 25 acres unutilized; and therefore there was no need to use the further land proposed, which was in a residential district. The land to the west of the works was in the centre of a manufacturing district, and no objection could be taken to manufacturing and storing gas there.

This concluded the case for the Bill.

Mr. Clode addressed the Committee, and asked that the Company's operations should be restricted to the 14½ acres on the west of the present works, together with the large acreage on the east, for which powers were given in 1881 but never put into force. With this large available area of land, there was no need to extend further into the residential district. The land in question, which amounted to six acres, would not be required for at least ten years; and he suggested that, as a compromise, it should be agreed that the six acres should not be used for gas-making purposes, and give full freedom to develop the remainder of the site.

Mr. *H. L. Houlder*, the Solicitor and Clerk to the Southall Urban District Council, and Mr. *Reginald Brown*, the Engineer and Surveyor, gave evidence.

Mr. Honoratus Lloyd, replying for the Company, said there was no desire to use more land than was necessary for the purpose. The fact was that a gas-works must be laid out as a whole, and the Company must have a large quantity of land in which to do this. A gas-works could not be laid out as a jig-saw puzzle. Therefore, to bind the Company to use but a small section of the land would render it impossible to extend the works in the most economical manner. The Council had undertaken this opposition without taking the advice of a gas engineer; and the suggestions as to how the works should be extended took no account of doing the work in the most economical manner.

The Chairman, after deliberation, announced that the Committee had decided that the Bill might proceed.

Swinton and Mexborough Gas Board Bill.

The Swinton and Mexborough Gas Board give notice of their intention to apply for leave to deposit a Bill in the present session to enable them: (1) To amend the obligation as to the supply of gas where the capacity of the main is insufficient, to make provision as to the mode of cutting off and re-connecting supplies, and to vary the price according to the purpose for which the gas is supplied. (2) To empower them and any company formed or to be formed for the purpose (*inter alia*) of producing gas and extracting residuals from coal, to enter into and to carry into effect agreements for the supply to the Board of gas for the purposes of their gas undertaking, upon and subject to such terms and conditions as may be agreed; to authorize the Board to supply such gas, and wholly or partially to discontinue their gas-works; to authorize the parties to any such agreement to execute any necessary works, and lay down mains in highways and elsewhere, whether within or beyond the Board's limits of supply, and to confirm every such agreement and make provision for carrying it into effect. (3) To empower the Board to purchase coke-oven gas or gas in crude or unpurified form, from any company, body, or person producing the same, and whether in bulk or otherwise, and to utilize any gas so purchased for the purposes of the gas undertaking and other purposes of the Board, and to supply any such gas to any authority, company, or person within the Board's limits of supply for heating, manufacturing, power, or other purposes; and to empower the Board, for the purposes of obtaining, procuring, conveying, utilizing, and supplying any such gas, to erect, maintain, use, lay down, repair, alter, and renew mains, pipes, and culverts within the Board's limits of supply and within the urban districts of Wath-upon-Dearne and the rural district of Rotherham.

Local Authorities (Enabling) Bill.

The text has been ordered to be printed of a Bill presented to extend the powers of local authorities in matters of finance and municipal trading. It substitutes a system of granting general powers, subject, in certain matters, to specific central regulation and control, to the larger local authorities for the present system of giving them specific powers for particular purposes. Clause 1 enables the councils of counties, the larger boroughs, and urban districts to acquire land, and do everything which a company, acting under the Companies Act, 1908, might lawfully do. Clause 2 specifies the procedure by which the powers set forth in clause 1 may be enacted. Clause 3 deals with borrowing powers and the sanction of the Board of Trade to loans, and compels a council to obtain the consent of Parliament through a Board of Trade Provisional Order when the proposed loan exceeds one quarter of the annual rateable value of the rated property in the council's area. By clause 4 the Board of Trade may authorize a council to exercise its powers under this Act outside its own area, when this is deemed desirable. Clause 5 enables councils to combine in an undertaking. By clause 6 a council is restrained from selling or leasing an undertaking for a longer period than seven years, unless it has obtained the sanction of the Board of Trade. By clause 7 smaller district councils and parish councils may exercise powers, but only with the Board of Trade's consent, and under conditions to be prescribed by them. Clause 8 requires every council to place the net profits of its undertakings in a common fund, which fund may not be used for the reduction of rates. Nothing in the Bill interferes with the existing powers of councils conferred on them by either Public or Private Statute, Provisional Order, or Common Law.

Sale of Gas at Bishop's Stortford.—The restrictions imposed by the Household Fuel and Lighting Order had a marked effect upon the business of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company; the sale of gas showing a reduction of 3,172,700 c.ft., or 5·5 p.ct., compared with the sale for the corresponding period of the previous year. The revenue from the sale of residuals, however, was £374 more. The balance to the credit of the revenue account for the past half year, the Directors stated in their report, was £3269. After providing for interest charges, an amount of £2622 was added to the profit and loss account, which, with £61 brought forward, made the balance available for distribution £2683. Dividends were recommended for the six months at the rates per annum (less income-tax) of 3¾ p.ct. on the "A" and "B" ordinary stocks.

Bexhill Water and Gas Company.—The half-yearly meeting was held last Tuesday, when the Directors submitted accounts for the past six months, showing a balance at the credit of the profit and loss account available for dividend of £6017. They recommend a dividend for that period at the rate of 4 p.ct. per annum on the 1885 and 1892 capital, and £2 16s. p.ct. per annum on the 1896, 1901, and 1904—less income-tax. This, with provision for income-tax, will absorb £2788, leaving £3228 to be carried forward to the next account. The restrictions of the Household Fuel and Lighting Order have caused a reduction in the consumption of gas, and have nullified the benefit which would have been obtained from the increase in price. The added costs in wages and of commodities used by the Company, as well as the additional cost of effecting necessary repairs, have also detrimentally affected the profits.

REGISTER OF PATENTS.

Producing Gas from Lignite.—No. 123,177.

Marks, E. C. R.; a communication from Società Anonima Italiana Gio. Ansaldo & C., of Genoa, Italy.

No. 2924; Feb. 19, 1918.

This is a process for the simultaneous production of a combustible gas and of a slag capable of being used for agricultural purposes from lignite and all the other solid combustible materials, such as peat, wood, coal, coke, and the like. Use is made of a gas-generator having the shape of a furnace of reduced size, in which the distillation and carbonization of the combustibles are carried out, and in which the ashes are melted by using a suitable flux.

According to the invention, phosphorite or phosphates of calcium are introduced into the producer in order to obtain a slag efficient for agricultural purposes. If lime alone is used, either by being added to, or by being already contained in suitable quantity in the combustible, the slag would be mainly constituted by calcium silicate, capable of being easily melted but having no agricultural value. If, however, a calcium phosphate (such as triphosphate of calcium) is added to the flux mixture, the former substance will be reduced to mono or di-phosphate of calcium, and the slag obtained will be capable of being assimilated by vegetables, and thus "constitute a manure of high agricultural and commercial value."

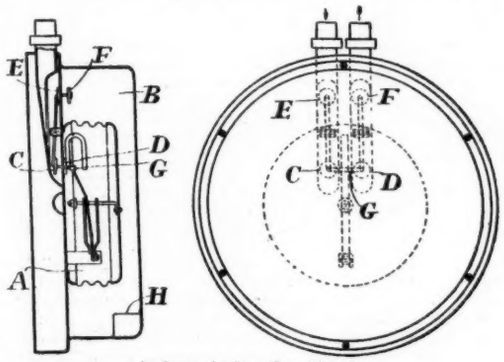
The sulphur due to the presence of pyrites in some combustibles will be prevented from passing into the gas by being fixed by the calcium oxide, and so pass into the molten slag.

Gas-Meters.—No. 123,300.

Anderson, E. E. W., of Stockholm.

No. 21,156; Dec. 18, 1918.

This gas-meter consists of a bellows, a membrane (or the like) arranged in a casing so as to divide it into two measuring chambers, which are alternately placed into communication with the inlet and the outlet of the meter by valves operated by the bellows or the membrane. The pressure of the gas in the first chamber will then rise, owing to the gas flowing into the chamber; and, consequently, the bellows will move and force the gas in the other measuring chamber out through the outlet. Gas-meters of this type as heretofore known are, the patentee says, "encumbered with the disadvantage of being very complicated, particularly as regards the arrangement of the valves and



Anderson's Dry Gas-Meter.

their connection with the bellows and with one another, so that they will easily fail." The purpose of his invention is to eliminate this disadvantage. The meter is broadly characterized by the fact that the two measuring chambers are arranged in the casing in such manner that one wall of the casing forms the bottom of both measuring chambers, and that all valves—inlet as well as outlet—are arranged directly in the bottom. In this way, it is possible to place the valves adjacent to one another (so that no long gas-channels are necessary) and to connect the valves with one another by simple levers.

The bellows is mounted in the casing in such manner as to divide it into two measuring chambers—an inner chamber A and an outer chamber B—so that one wall of the casing forms the bottom of both measuring chambers. In this bottom, all gas-valves are located; being formed as simple disc valves. The meter is provided with two pairs of valves—one valve C of one pair forming the inlet valve for the gas to, and the other valve D the outlet valve from, the inner measuring chamber; while the valve E of the second pair forms, in similar manner, the inlet valve for the gas to, and the other valve F the outlet valve from, the outer measuring chamber. The valves are arranged in such manner that the inlet valve to the chamber A and the outlet valve from the chamber B are opened simultaneously, when the two other valves are closed, and *vice versâ*. For this purpose, the valve bodies are secured to pivoted levers connected by the spindles of the valves with the armature G of a horse-shoe magnet. Two springs are secured to the arm supporting the magnet; one spring being on each side of the arm, and secured to the movable bottom of the bellows, which is connected by a device (not illustrated) with a counter indicated at H.

Measuring Gases.—No. 123,343.

Cockey, F. G., of Woodford Green, and the Gas-Meter Company, Ltd., of Kingsland Road, E.

No. 16,467; Nov. 9, 1917.

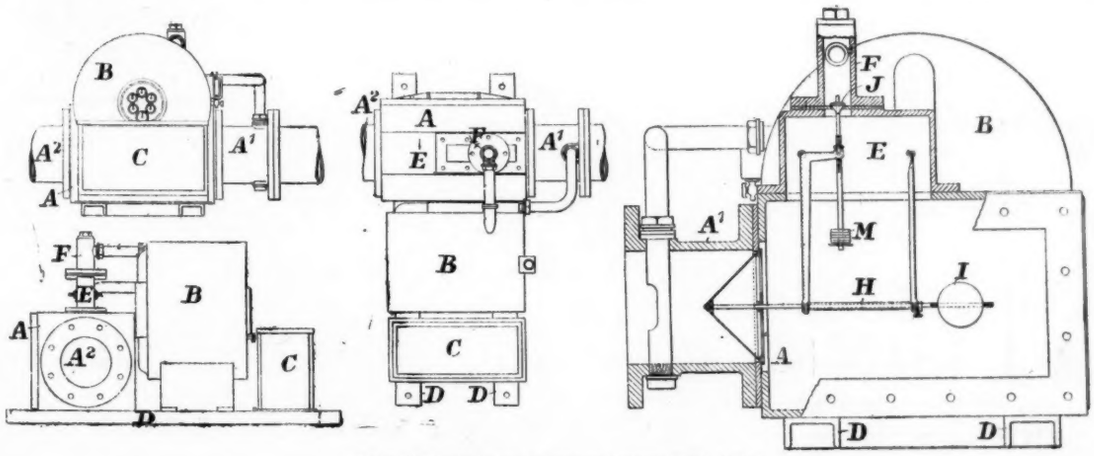
This invention relates to proportional meters—apparatus for measuring a definite proportion only of the total volume of gas flowing through mains; the total volume being calculated on the basis of this proportional measurement.

The meter comprises a main valve suspended in such a way that it tends to gravitate into the closed position, whence it is lifted or opened more or less by the direct pressure of the gas; while the shunt-valve is in direct communication with the outlet from the shunt-meter which it controls.

A front and side elevation and a plan of the meter are shown; also a sectional elevation of the valve chamber on a larger scale.

A is a chamber or valve-box of rectangular form to be connected in a straight length of gas-main and enclosing the main valve. B is the shunt-meter (a wet meter of known design) with means for maintaining the accuracy of the water level. C is an integrating recorder, operatively connected with the meter. All three parts are fixed to the same base D, so that the arrangement is self-contained. The main valve-box has an extension piece A^1 at the inlet end, which is traversed by a small pipe connected with the inlet of the meter; and a portion of the gas flowing towards the valve chamber enters the pipe through an aperture in it, and is bye-passed through the meter. Between the valve box and the extension piece is fixed an apertured metal disc or ring forming a seating for the main valve, which consists of a sheet metal cone fixed to an apex piece and base frame or spider by which it is supported on a horizontal spindle. The spindle is guided so as to move longitudinally in a rectilineal path normal to the plane of the valve-seating; and for this purpose it works on friction rollers in suitable guides, or else it may be carried (as shown) by parallel suspension rods. These rods (of sheet metal bent to a **U** section) are pivoted on centres in a small chamber or box E above the main chamber, and in communication with it through an opening in the top. To facilitate adjustment, the rods are connected to the valve spindle at their lower ends by a sleeve H, the forked ends of the rods having a pin and slot connection with the sleeve, which is a sliding-fit on the rod, and is fixed by a clamping screw. A weight I on the free end of the horizontal valve spindle counterbalances the weight of the main valve, which bears lightly against its seating and offers little resistance to the flow of the gas.

A small shunt valve J, actuated by the main valve, controls the flow of gas from the shunt-meter to the chamber A, where the bye-passed gas rejoins the main stream which has flowed past the valve and leaves the chamber at A^2. The valve-seating is formed in a plate fixed between the top of the chamber E and a tubular casing F connected with the outlet of the shunt-meter B. From the suspension rod of the main valve a short arm extends at right angles, and is bifurcated and recessed to engage a trunnion nut adjustable on a depending spindle of the valve J. The movement of the valve is thus communicated (in a



Cockey's (Gas-Meter Company) Proportional Meter.

reduced degree) to the valve J, the seating of which is definitely proportioned to the area of seating of the main valve. By applying weights M to the valve-spindle, a variable pressure can be transmitted along the spindle of the main valve for purposes of adjustment.

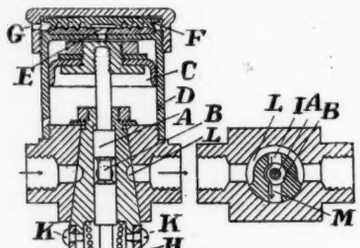
Automatically Controlling the Supply of Gas to Lighting and Heating Installations.—No. 123,406.

Scott-Snell, C., of Wimbledon.

No. 3191; Feb. 22, 1918.

The object of this invention is to delay the total cutting-off of gas from the main supplies after the control device has been turned in the required direction—for example, the illumination in a room may be maintained sufficiently long to enable a person to find the way into another apartment.

Although reference may be made to a single light, the invention is also adapted for use on a larger scale, and can be applied to a group of lights; thus a service to servants' quarters would be arranged so that the supply could be cut off locally, or the meter turned off at a pre-arranged period after it has been put into the closed position by a person operating the cock.



Scott-Snell's Automatic Burner Controller.

The invention more particularly consists in a plug cock fitted with an internal supplementary valve having longitudinal motion, and which controls the flow of gas through a bye-pass aperture and which, furthermore, may be made operative or otherwise according to the motion given to the finger piece.

Various means have already been suggested to produce a delayed action in the control of the gas supply; such means generally involving a special form of valve and presenting no alternative to a delayed motion when operated. My invention, however, utilizes the well understood plug cock, and offers the alternative of instant extinction or delayed action, and, furthermore, effects its purpose in a simple and inexpensive manner.

Vertical and horizontal sections of a pneumatically controlled gas-tap for the purpose are shown.

A cone-shaped plug is bored through vertically, and a spindle A is passed through it. This has a contracted section B in the middle. At the upper end it is fitted with a cup leather C, working in a cylinder D, to which air is slowly admitted through the aperture E, after passing around a spiral passage (in a metal disc F) upon its entry from atmosphere at the aperture G. By screwing-down the cap, the air passage can be restricted by forcing the spiral rib into a rubber pad below it. A spring H acts downwardly upon the reverse end of the spindle, and tends to cause it to close the cross passage I.

The finger-piece J has facility for vertical travel as well as power to transmit rotative motion to the plug through side-screws K. In the position shown, it is assumed that upward manual force has compressed the spring and raised the spindle and cup leather. Gas is meantime flowing through the groove L in the plug; and on turning the plug to the off position, it can still flow *vid* the cross passage (shown by the arrow M) which then exists, but which slowly closes as the air flows into the cylinder and the spring causes the spindle to fall—ultimately settling so that the centre passage is choked. The gas may then be turned on by the rotation of the plug without raising the finger-piece, and can be instantaneously cut off again if the finger-piece be not raised.

Feeding the Furnaces of Gas-Retort Settings, &c. No. 123,617.

Masters, E., and Gibbons Bros., Ltd., of Dudley.

No. 4805; March 19, 1918.

This invention has reference to improved means for feeding the gas-producer furnaces of gas-retort settings and the like.

Heretofore in apparatus for feeding and burning finely-divided fuel it has been proposed, the patentees state, to employ a continuous scraper conveyor with the conveyor trough arranged over the charging openings of a row of steam-boiler furnaces—the conveyor trough having bottom openings, controlled by sliding gates, to permit of the fuel falling into the open mouth of a hopper furnished with a cam-operated flap-valve which is automatically opened at regular intervals to permit of the fuel in the hopper falling down on to the fire-grate. This known arrangement, however, is "not suitable for gas-producer furnaces, because the gas could escape at the fuel hopper."

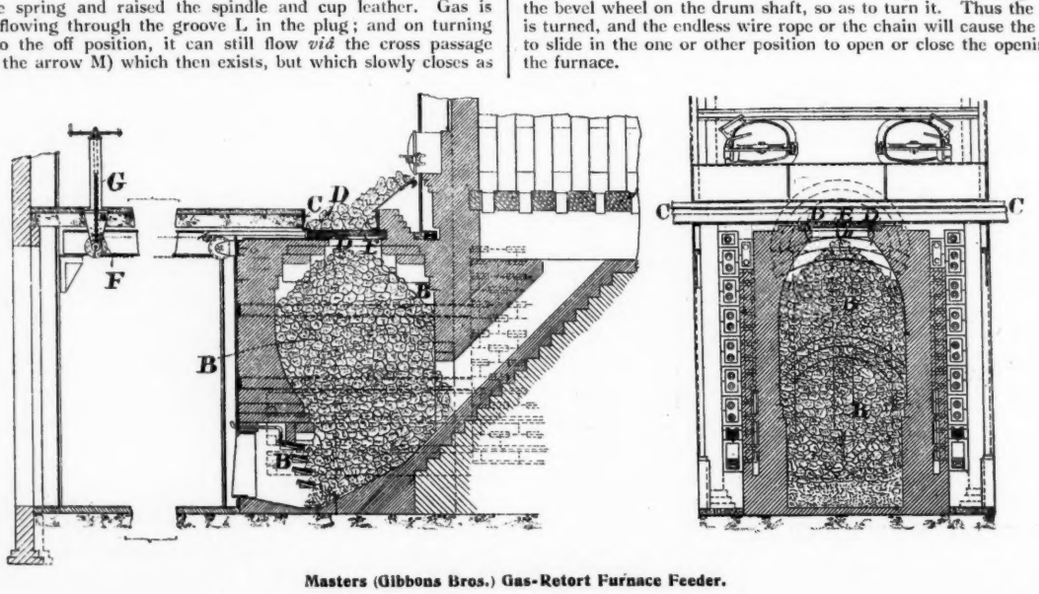
According to the present invention, the furnaces arranged in a row are fed by a conveyor immediately above and travelling across them; the conveyor trough having in its bottom part outlets corresponding with the furnaces, and each furnished with a sliding door over the inlet into each furnace and adapted to make a gas-tight closure, so that as (say) the coke is continuously conveyed by the conveyor along the trough above the tops of the furnaces, any furnace can be fed by sliding open the corresponding door and allowing the fuel to fall through the opening into the furnace from the conveyor.

When the invention is applied to the furnaces of gas-retort settings, the conveyor employed can be the usual hot-coke conveyor which receives the coke from the mouthpieces of the retorts, but is specially constructed with the sliding-doors in its lower part, with means for opening and closing them immediately below the conveyor, and preferably in front of the gas-retort settings.

A longitudinal sectional elevation is given of a portion of one of the retort-settings and its gas-producer furnace; also a cross sectional elevation.

The gas-producer furnaces B are arranged at the front of the setting and below the floor line of the discharging stage with the hot-coke conveyor (of which the trough only is shown at C) arranged to travel across the tops of the furnace. This conveyor is preferably of the scraper type, having downwardly projecting scrapers carried by side chains and scraping the coke along the bottom of the trough, the top of which is preferably about flush with the floor line of the discharging stage. For each producer furnace there is in the bottom of the conveyor trough an opening D, closed by a sliding valve or door E adapted to work along side guide bars, preferably made with inclined surfaces, which are ground (as are also the corresponding surfaces of the sliding valve or door E) so as to make a comparatively air and gas tight closure. The valve E extends right across the bottom of the conveyor trough from side to side, and the top part of it is made flush with the bottom of the conveyor trough. Guide-bars are continued underneath the discharging stage sufficiently far as to support the valve E when sliding into its open position. In addition to this valve fitting on the inclined side guides, the back of the valve fits, and slides along, a plate fixed at the top of the brick work of the furnace.

Any convenient means can be adopted for operating the sliding-valve or door E; but the preferred arrangement is that illustrated. In this arrangement, the front of the valve has a forwardly projecting extension arm fixed to it, which at its front end is fixed to a continuous wire rope or chain fixed round, and connected to, a drum F, and also round a guide-pulley. The drum is conveniently carried on the shaft of a downwardly projecting bracket fixed to the bottom of an upright stand G, which carries a vertical handle shaft at the top for turning it. Fixed on the lower end of the shaft is a bevel pinion which gears with the bevel wheel on the drum shaft, so as to turn it. Thus the drum F is turned, and the endless wire rope or the chain will cause the valve E to slide in the one or other position to open or close the opening D to the furnace.



Masters (Gibbons Bros.) Gas-Retort Furnace Feeder.

MISCELLANEOUS NEWS.

SULPHATE OF AMMONIA SELLING SCHEME.

The Project Discussed in London.

A Meeting was held in the Cannon Street Hotel last Thursday afternoon, for the purpose of discussing the scheme for co-ordinating and extending the activities of the existing Sulphate of Ammonia Association, full details of which were given on pp. 647-8 of last week's "Journal." The chair was taken by Mr. D. Milne Watson.

The Chairman's Opening Remarks.

The Chairman, in opening the proceedings, pointed out that the meeting had been called with a view to furnishing any desired information with regard to the details of the proposals which had been laid before them. The introduction to the scheme dealt very fully with the past history and the present position of the sulphate of ammonia market. He thought it important to state that the movement for the formation of the Selling Corporation had come from the large makers of sulphate of ammonia; and they would see that the names at the end of the introduction to the scheme were representative of all the chief classes of producers—oil makers, coke-ovens, iron masters, and the gas undertakings. The question had been asked why the Sulphate of Ammonia Association could not continue to carry on the sulphate of ammonia trade of the country in the way it had done through the past two years. The answer was that, whatever success had attended the efforts of the Association had been in spite of, and not because of, its constitution—apart, of course, from the question of Government control. It was because the largest members of the Association felt that its present constitution was far too loose to enable it to undertake business on a scale adequate to the market conditions in the future, that this scheme had been put forward; and it was hoped that the Corporation would rise phœnix-like from the ashes of the Sulphate of Ammonia Association. He would like to emphasize the necessity of a prompt decision with regard to this question. Sulphate of ammonia makers would be faced with a very difficult position during the summer months; for not only was the export demand uncertain and freight difficult to obtain, but there was also the difficulty that prices were subject to enormous fluctuations at the present time. Therefore, it was essential that the Corporation should be in a position to make preparations immediately, if they were to commence operations on June 1, when it was expected that a large measure of the present Government control would be removed. There was also the fact that the Board of Agriculture had asked the Makers' Sub-Committee to meet them early in April, with a view to discussing the whole question of control and prices for next season; and it would certainly make a very substantial difference to the attitude of the Government if the makers' representatives could state that the Corporation had been duly formed; for the Government would then be able to feel reasonably secure that the requirements of the home market would be properly provided for. Any proposals which were made by the Government would, of course, be submitted to makers for their consideration. He did not think it was necessary for him to add anything further; but he would now call upon Mr. F. C. O. Speyer, the Manager of the Association, who had attended a large number of meetings in the Provinces, to make a short statement with regard to questions which had been raised. Further questions from makers present would then be invited.

Features of the Scheme.

Mr. Speyer said it would probably save a certain amount of time if he referred first of all to two or three questions that had been raised at previous meetings. He had attended gatherings at Newcastle, Bradford, Sheffield, Cardiff, and Nottingham; and they had been very successful. There had been no objection on principle raised to the scheme; such criticism as there was having been confined to details. The Newcastle meeting was, in a sense, the most important, because it was a gathering representing the whole of the coke-ovens on the north-east coast; and their Association adopted a resolution strongly recommending individual members of the Association to join this new Corporation. If he might describe the scheme shortly, he should say it was in the nature of a declaration that British sulphate of ammonia makers intend in future to have a voice in the marketing of their product, and as to the destination to which it is to go. The scheme provided machinery for this purpose. Before the war, the makers depended almost entirely for their market on a limited number of export merchants; and the result of this dependence, broadly speaking, was that, as the number of individual makers increased, the competition between maker and maker to sell increased. But at the same time the maker only had an outlet for his products through dealers. Thus the makers' market was gradually getting narrower; and the maker was deprived of a certain amount of first-hand knowledge of market conditions which was of the utmost value to the dealer. Under the scheme, this position would be fundamentally changed. It was not intended to go beyond the dealers so far as the export market was concerned; but they proposed to make an arrangement by which the dealers would have a fixed percentage as commission, and give the Corporation the first refusal of all business, and generally act as their agents. This would prevent any tendency on the part of the dealers to speculate, and provide a reasonable method of settling difficulties. As to the home market, the increase in consumption during the war had been colossal, and had been chiefly due, he thought, to the absence of foreign competition in other forms of nitrogen. But they could not hope that this state of affairs would continue. On the contrary, they would no doubt be faced with very severe competition from nitrate of soda, nitrolim, and possibly other forms of nitrogen; and, to his mind, the only way in which they could retain the home market would be by stabilizing prices, by furnishing the best possible quality, and by providing supplies when and where they were required. All these requisites seemed to him to imply a central organization. He did not see how the home market was to be properly organized otherwise; and it was obvious, if the home demand was to be maintained at anything like the present figure, it would be necessary to provide a considerable amount of storage accommodation. In this connection, he would like to say that, while it would probably be the ultimate object of the Corporation to establish a uniform price for the home market, the individual maker would not be suffering from the same difficulties as now. All of them, under Government control, had had to do a lot of things they were not in the habit of doing before. The Corporation proposed to take delivery at the works of the sulphate of ammonia as it was produced, in bulk. They would provide bags; and therefore the individual maker's responsibility would cease entirely as soon as he had turned out sulphate of good quality at his works. An objection had been raised with regard to this storage accommodation. It had been pointed out that there might be a danger that the Corporation would endeavour to pile-up stocks when prices looked weak, with a view to holding-up the market; and that the operation might not be successful. This, of course, was not the object of the storage scheme. If it were found necessary to put up storage in addition to the accommodation existing at makers' works, it would be in order to meet a known home demand at a certain place. A further objection had been raised with regard to the length of the proposed contract referred to in clause E (1). The contract between the individual maker and the Corporation was to be for ten years; but the individual maker had the option of going out after the first trial period of two years. If he did not exercise his option, he then remained bound for a further four years. This trial period had been suggested after a good deal of discussion. It was felt it would be unfair to attempt to bind makers for so long a period as six years straight off; but, at the same time, if the Corporation were to do the work they set out to do, it was essential that they should have security for a certain number of years. If, for instance, they were to undertake storage schemes, it was necessary that, after the first trial period, they should be in a position to look forward for a certain number of years. They must write-off the expense of storage out of current receipts; so that if the period for which the Corporation were formed was a very short one, it would mean a heavy tax on the price over this period—so heavy, indeed, that the storage scheme might have to be abandoned. Then a question had been raised as to the amount of capital which would be required. In the introduction to the scheme, it was suggested that ultimately the sum of £500,000 would be needed. This maximum figure had been put forward on the assumption that the whole of the present make of sulphate of ammonia—about 400,000 tons per annum—would join the scheme. He did not think it would be necessary to call up anything like this amount at the beginning. Probably a nominal working capital of from £50,000 to £100,000 would be quite sufficient—at any rate for the first two years. In this connection, a factor had arisen which was not foreseen when the scheme in its present form was put forward. The municipalities were unable to subscribe capital; and their case was provided for by enabling them to become contractors, and not members. This would not affect the scheme to any large extent, because the production of municipal bodies was only 35,000 tons for the United Kingdom; but a difficulty had been raised now with regard to the statutory gas companies, who apparently were also under a disability in the matter of providing capital. This was a question which would have to be further considered by the Committee. But a possible solution had been found, in a proposal to ask the statutory companies who were debarred from providing capital to give a letter of guarantee to the Corporation's bankers for so much per ton on one year's make. The Corporation would then be able to borrow money on the strength of these letters of guarantee. He could not bind the Committee definitely to this solution; but it seemed to him to be a good idea.

Questions and Answers.

A number of points were then raised by different speakers; but, in the main, the nature of these will be sufficiently gathered from the replies made by Mr. Speyer.

Mr. Holliday (Acton Hall Collieries) inquired as to whether it was obligatory to subscribe capital, and whether the Corporation would take the sulphate as produced.

Mr. Speyer said it was proposed to make the provision of capital obligatory for all members of the Corporation. At the end of clause E (1), it was stated that the Corporation were to guarantee to remove each contractor's production from his works in such a manner as to enable the contractor to produce continuously. There would be no attempt to penalize those who had large storage accommodation, in order to help others who had not. A normal storage basis would be fixed; and when the Corporation asked any maker to retain more than this normal storage quantity, the Corporation would pay for it.

Mr. R. W. Edwards (Aldershot) remarked that he was not quite sure that this would not be equivalent to raising capital. This matter constituted a serious difficulty for the statutory companies.

Mr. Speyer replied that he was advised that some statutory companies, at any rate, would provide guarantees of this nature.

Mr. R. G. G. Moon (Bournemouth) asked what was the objection to treating statutory companies in the same way as municipal undertakings—ten years' contract. This was the method they had adopted in connection with the Southern tar scheme, where the same difficulty arose. The distillers found the capital, and were allowed a certain rate of interest for the use of it. No doubt some of those present would like information as to why it was so large a capital as £500,000 was needed. Was it to provide stores, or sums of money out of which to pay for floating stocks? He made a calculation showing that, even in these times, £180,000 would be an outside figure for any storage accommodation that might be required.

Mr. Speyer pointed out that the sum of £500,000 had been put forward on the assumption that the whole production would join the Corporation. It was an outside figure, and was not intended to be an exact estimate. No more capital would be called up than was found to be absolutely essential. There would be financing of stocks, in addition to storing; and probably the cheapest way to finance these stocks would be against bankers' warrants. Any position in which

one section of producers was called upon to finance another section would be entirely inadmissible.

Mr. Edwards said it seemed to him to be worth considering whether the coke-oven people, and so on, would not find the capital at some agreed return, and leave the other parties as partners in the concern without finding capital. In the gas industry, their hands were tied.

Mr. Speyer, referring to the scheme, called attention to the fact that clause D was to the effect that the Corporation would co-operate with the Sulphate of Ammonia Association in carrying out the propaganda work hitherto done by the Association; but the Association would, in case of need, retain its separate identity as a propaganda body. Objection had been taken to this as implying a sort of duality of control; but this was not the intention. Members of the Sulphate of Ammonia Association who joined the Corporation would not be called upon to pay a separate subscription to the Sulphate of Ammonia Association; but it was necessary to insert the clause to which he had alluded, because it was conceivable that some of the producers would not join the Corporation. In that case, if the Sulphate of Ammonia Association were simply wound up, these producers would have no body by which they could be asked to contribute for propaganda purposes; and it would be only fair to the members of the Corporation, who would be contributing to propaganda, that the makers outside should bear their share.

Mr. Charles Chambers (Harrow) inquired whether they would be debarred from selling sulphate of ammonia locally. If they joined, must they sell it all through the Corporation?

Mr. Speyer replied that this was fully provided for in clause 13 of the introduction. A maker who had built-up a farmers' trade, for instance, would be amply protected. If he brought such orders to the Corporation, he would be credited with the extra price; and this would fully safeguard his position. In practice, he thought it would be quite possible to devise a system by which a maker would actually invoice to his local customers, and simply account to the Corporation for the sum of money received. But, of course, every ton of sulphate which a member or contractor produced would be the property of the Corporation by his contract. They desired a prompt decision as to membership. As had been pointed out, the intention was that, where makers could contribute capital, such contribution should be obligatory. The object was to enable the Corporation to control as large a quantity of sulphate as possible.

Mr. Moon said it was mentioned in the scheme that special consideration would be given to producers with regard to quality. He would like to be clear that this question of quality depended, not only upon nitrogen content, but also upon the neutrality of the sulphate. Many of them were putting in neutralizers, so that they could compete on even terms with German sulphate; and people who did this ought to be assured of the extra market value accruing to them.

Mr. Speyer replied that, in saying quality would be taken into account, all the aspects were referred to. There were conditions even more important than the nitrogen content. The acid-free sulphate of ammonia now being produced was superior to anything the Germans turned out before the war; and this was the quality, he was convinced, which would be required in the future. Obviously, therefore, the Corporation would not penalize anyone who adopted any of the known processes for producing sulphate of this quality. While it was thus very desirable that every producer should make this perfect sulphate immediately, it was very doubtful whether it would be possible. They would have to proceed gradually; and he could not conceive a position in which the Corporation would endeavour to coerce a manufacturer who was obviously incapable of increasing his storage capacity or (with existing plant) of turning out sulphate of the desired quality. He would be penalized in comparison with other makers by getting a lower price. To clause 10—stating that each contractor to the Corporation would be required to comply with such conditions as to the storage capacity to be provided and the standard of quality to be manufactured as shall be determined from time to time by the Executive—there was a saving clause: "In the event of contractors finding difficulty in complying with the requirements of the Executive as regards storage capacity and quality, the Executive will consider special cases on their merits." The Executive might be relied upon to adopt a reasonable attitude.

Mr. W. H. Bennett (Redhill), who had raised the point, said that some companies had boggled at this clause.

The Chairman said the object was to see that there was adequate storage, and that the quality was up to the standard. The endeavour would be to work the quality up until in course of time nothing but the best was produced; and those who were not going to adhere to this policy would be no good at all. They would not be expected to do it at once, but as and when it became possible. He did not see how this part of the contract could be modified without the whole fabric of the Corporation falling to the ground.

Mr. Speyer, dealing with further points raised, said every maker must be prepared, if necessary, to store for the Corporation (without payment) a certain amount of sulphate; but the moment the Corporation called upon him to store more than this quantity, the maker would receive a payment on account of the excess amount. The individual maker storing would not suffer at all as regards market price.

Mr. Langford said he wanted his Company to join the scheme; but until the details were arranged, they would like to feel that signing would not definitely bind them to join should matters not be settled in a manner satisfactory to them.

Mr. Speyer remarked that he thought this was provided for by the form at the end of the scheme.

The Chairman, in thanking those present for their attendance, said he felt it was very important that they should have this Corporation, and that everybody—whether municipalities, gas companies, or collieries—should make a great effort to overcome difficulties and join. They must be prepared to sacrifice something in order to secure what he believed was absolutely essential for the future well-being of the sulphate maker.

Before separating, the sense of the meeting was taken; and it proved to be practically unanimously in favour of the scheme—subject to details being satisfactorily arranged.

BRITISH GAS LIGHT COMPANY, LTD.

The Half-Yearly Ordinary General Meeting of the Company was held last Wednesday, at No. 11, George Yard, Lombard Street, E.C.—Mr. R. S. Gardiner in the chair.

The Acting Secretary read the notice of meeting, in the absence, through indisposition, of the Secretary (Mr. A. W. Brookes).

Absences and Indisposition.

The Chairman said he was sure the shareholders would share the regret of the Board at the absence of their senior Director, Mr. Frederick Wilkin, who was seldom away from their meetings. He was confined to his house by a severe cold. They all sincerely wished that his recovery to health would be speedy. They were also all sorry at the enforced absence of their Secretary. Mr. Brookes was confined to his bed by a severe attack of lumbago. He (the Chairman) was present in opposition to his doctor's orders.

The Causes of an Unsatisfactory Profit.

Proceeding, the Chairman said that, in accordance with a wish expressed by a shareholder at the last meeting, the Directors' report had been issued on this occasion with the accounts to all the shareholders; and he therefore presumed they would take it as read. [Agreed.] The net profit for the half year amounted to £5661, and those who had examined the accounts in detail would have realized that this was entirely due to the very unsatisfactory amount of profit earned at Hull, which was £19,089 below the parliamentary standard, of which he would explain the causes. The chief was the unsatisfactory quality of the coal supplied to the Company under the orders of the Coal Controller. A considerable portion of the coal the Board had purchased as being suited to their requirements was diverted by the Coal Controller from the Company and sent to other users, to whom it was probably quite as unsuited, as some of the coals supplied to the Company from Staffordshire, Derbyshire, and Durham were unsuited to their carbonizing plant. The figures he had to give on the subject were somewhat startling. The make of gas fell to 10,866 c.ft. per ton from over 12,000 c.ft. per ton. The coke left for sale was only 7·75 cwt. per ton of coal, instead of a normal output of 10 cwt. To add to their troubles, certain parts of the carbonizing plant got out of repair, and owing to the makers being compelled to give precedence to other work, several months elapsed before the damaged parts could be replaced. They had, therefore, to bring into immediate use an old installation of horizontals, and one of inclines; and the additional labour required was most difficult to obtain, costly, and not altogether satisfactory.

Details from the Stations—Increases in Price.

The sales of gas at Hull since the war had decreased by no less than 18 p.ct. He need hardly point out that with the same or higher standing charges—such as interest on debentures, salaries, &c,—a decrease in business of this magnitude must seriously affect the net earnings. The coal carbonized in the half year at Hull cost 6s. per ton more than in the corresponding half year; oil, £14,768 more; and labour, £9952 more. The position at Hull was engaging the very serious attention of the Board; and he sincerely hoped and believed that the current half year would show some improvement. At Norwich, the profit was £586 short of the parliamentary interest; at the Potteries, £381 short; at Trowbridge, £900 short; and at Holywell, £406 short. This showed that they had been rather reluctant to increase the price of gas at the stations; and it was also partly due to the advance of wages and materials of all sorts, which could hardly have been anticipated. The Board had, therefore, been obliged to make the following increases in the price of gas from April 1: At Hull, from 3s. 2d. per 1000 c.ft. to 4s.; at Norwich, from 3s. 8d. to 4s.; at Trowbridge, from 4s. 4d. to 4s. 6d.; and at Holywell, from 5s. to 5s. 6d.

General Results.

Dealing with the operations of the Company as a whole, the additions to capital during the half year amounted to £8569, of which £5179 was expended at Norwich, partly on the acquisition of land, and partly in laying down new feeder mains that were necessary to improve the pressure in certain districts. Coal cost £5085 more than in the corresponding half of 1917; labour, £20,507 more; and oil, £18,026 more. The total sales of gas in the half year showed a decrease of 2¾ p.ct., which was due to the restrictions imposed by the Household Fuel and Lighting Rationing Order. The amount expended in the half year on allowances to the families of the Company's workmen who joined the King's Forces was £2324—making a total outlay of £13,398 on this account since the outbreak of the war. The net financial result of the half-year's workings was that, in order to pay the usual dividend of 5 p.ct., they would have to appropriate £14,288 from the undivided balance, which would still leave the considerable sum of £51,375 to the credit of the account, irrespective of the reserve fund.

A Ten per Cent. Dividend, but no Bonus.

The Directors were sorry to have to ask the shareholders to forego the usual bonus of 2s. 6d. per share; but they did so not only on account of the insufficient profit earned in the half year, but owing to the very grave outlook in regard to both coal and labour, in the face of which the Board were of opinion that it would be unwise and imprudent to recommend the payment of the usual bonus. It would be easy for him to represent to the shareholders that a dividend at the rate of 10 p.ct. per annum was one that should be considered highly satisfactory in present circumstances. But it would be ingenuous and misleading on his part if he were not to point out that, unlike many other gas companies who in past years had re-adjusted their capital to the market value, this Company's shares had remained at their original nominal value of £20, and had been issued to the shareholders and acquired by purchase during the last twenty years at prices varying from £40 up to £55 per share. Consequently, to the purchaser at (say) £40 a share, the present dividend was only equivalent to a return of 5 p.ct. per annum, less income-tax; and to a purchaser at £50, only 4 p.ct., less income-tax. However, the present dividend compared favourably with that of many other gas companies. He hoped he had made it clear that the unsatisfactory results of the half year were entirely due

to exceptional circumstances at one only of the towns the Company supplied, and that it was partly due to circumstances arising out of State control.

THE KING'S FUND AND A MISLEADING STATEMENT.

One occurrence during the half year to which he ought to refer was the receipt by all the shareholders of a circular from the Ministry of Pensions, asking them to contribute to the King's Fund for the Disabled, on the ground of the "increased prosperity of the Company—a prosperity brought about in some measure by war conditions." He (the Chairman) need scarcely say that in the face of the diminished profits of late, this flagrant misstatement caused not a little indignation. Numerous letters were received from shareholders which showed they had been not a little disturbed by the misstatement. The Board had been asked by the Ministry to furnish them with a list of shareholders. At the time, the war was still in progress; and although the Government had shown no consideration for the gas industry, the Board felt it would be unpatriotic to refuse the request, although they were not aware of the reason for it. The Company had a system of stencil plates with the names and addresses of their shareholders, and could therefore more easily supply the information than it could have been supplied at Somerset House, from which it could have been obtained by the Ministry if the Company had refused to furnish it. On receipt of the circular, the Board at once consulted Counsel as to what steps they could legally take to compel the Ministry of Pensions to withdraw their inaccurate statement. Owing to pressure of work, Counsel took some weeks to advise them, but eventually approved of a letter being addressed to the Ministry, who replied regretting the issue of their circular. The Chairman read the correspondence with the Ministry of Pensions. The circular-letter addressed to the shareholders stated:

You have lately shared in the increased prosperity of the British Gas Light Company, Ltd.—a prosperity brought about in some measure by war conditions. The same conditions have brought heavy losses to the disabled fighting men. I beg you to share your prosperity with them. They have earned your gratitude. I am appealing for funds to re-establish these men in civil life. Will you help by sending a subscription to the King's Fund for the Disabled? £3,000,000 is wanted, and wanted quickly. The fund does not interfere with any state grant or pension to which a man may be entitled.

Subsequently, the Secretary wrote to the Ministry of Pensions as follows:

A number of the shareholders of this Company have forwarded to me a copy of a letter you addressed to them under date of Nov. 1, 1918, stating that they have derived a benefit from the increased prosperity of the Company, and alleging that this is partly due to war conditions. I am instructed by my Directors to inform you that both these statements are untrue in fact, and that their inaccuracy could have been easily ascertained from inquiry of myself. They are calculated to induce a feeling of disquietude among the shareholders, and to imperil their confidence in the Court of Directors. I am instructed to request you to write a letter to the Directors withdrawing these statements, and expressing regret that they should have been made. Kindly let me hear from you within a week, as the mischief is continuing.

To this the Ministry of Pensions replied:

I am directed by the Minister of Pensions to acknowledge your letter of the 18th inst., and to say that he regrets that the letter referred to should have been sent out in his name. It is unfortunate that the Secretary of the Company was not previously consulted. The circular in question was withdrawn a fortnight ago, when it came to my notice.

Proceeding, the Chairman said he believed they were legally entitled, and were so advised, to ask the Ministry to bear the cost of sending a copy of the correspondence to each shareholder. But this would only have been done at the expense of the taxpayers; and as hostilities had ceased in the meantime, and as so many weeks had elapsed since the offence was committed, it was thought better to let the matter rest.

AS TO THE FUTURE.

The shareholders would expect him to make some comment on the outlook. As far as the individual circumstances of the Company were concerned, he saw no grounds for special anxiety; and he was exceedingly glad to notice that the dropping of the bonus had not affected the market value of the shares. But the general outlook, in so far as the whole gas industry was concerned, was undoubtedly very serious. In regard to coal, whether the cost would be still further increased, or whether the cost of the additional wages exacted by the miners would be thrown upon the taxpayer or the coalowner, did not appear to be quite clear. It might be that the existing heavy burden on this account might be further increased; but it seemed probable that in any event the supply of coal would continue to be controlled by the State, and that the gas industry would not be allowed to procure the sort of coal that was suited to its requirements. The late Coal Controller took credit to himself for saving train mileage; and he (the Chairman) noticed that, in the report of the miners' representatives on the Coal Commission, the saving of rail transport was mentioned as one of the advantages to be gained by State ownership of the coal mines. It was obvious that the losses sustained by the community at large through the supply of unsuitable coal to various industries had been entirely disregarded. Apart from the fact that if unsuitable coal was supplied a larger quantity was necessary, and consequently a greater quantity had to be carried, there was hardly an industry in the country that had not suffered pecuniary loss from having been supplied with unsuitable coal; and surely such losses should be taken into consideration before any conclusion could be arrived at as to the net result of a saving of train mileage. He hoped that not only the National Gas Council, but the representatives of other industries would make strenuous efforts to bring home to the Coal Controller and other officials who might hereafter control the disposal of coal, the wrong that was being done in this particular. And it was of extreme importance to the community. The other anxiety was as to the future cost of labour. In October last, all gas workers were granted an advance of 3s. 6d. per week; and in February a further advance of 5s., and in addition a bonus of 12½ p.ct. The average wage of a stoker at Hull in March, 1914, was £2 4s. 4d. per week; at the present moment, it was £4 4s. 5d., or at the rate of £219 9s. 8d. per annum. As the gas industry had decided to act together in the matter, the Company's future was bound up with the decisions that might be arrived at by the leaders of the industry. He hoped that, notwithstanding the reduction of the dividend, the Directors would continue to possess the shareholders' entire confidence, which was more than ever necessary as an encouragement to face the many difficulties with which they were confronted. Reverting once more to coal. He had just returned from France; and he was informed on good authority that it would take eight to ten years to bring back into normal working the collieries in the North of France, which had been so ruthlessly, so systematically, so devilishly destroyed by the enemy. He was told that it would be necessary to sink new pits, and open-up new roadways; and notwithstanding all the ingenuity and energy of French engineers, these two operations would require several years to elapse before the pre-war output could be re-established. Therefore it seemed obvious that, even if the British miners settled down to work, and did their very best, for a long time to come the output of coal would be insufficient to meet the requirements of this country, France, and Italy, let alone the demands of Belgium, Denmark, Sweden, and Norway. So that their anxieties in regard to an adequate supply of coal were likely to continue for some time. It was a great strain on the Directors and Engineers; but with the unabated confidence and support of the shareholders, no pains or watchfulness would be wanting on the part of the Board and the officers. He moved the adoption of the report and the accounts.

Major-General W. T. Corrie seconded the motion, which was unanimously carried.

The Dividends

On the proposition of the Chairman, seconded by Major-General Corrie, a dividend for the half year was declared of 20s. per share, less income-tax.

Votes of Thanks.

Mr. Henry Woodall moved a vote of thanks to the officers and staff. He said that it was a great privilege to move this resolution, because, as the shareholders all knew, the half year had been of the greatest possible anxiety to everybody who had to manage gas undertakings in this country. The Company had been well served by their staff; and they thanked them most heartily for the work done.

Lieut. Harold G. Palmer seconded the motion, which was heartily passed.

The Acting Secretary having acknowledged the vote in the name of Mr. Brookes and all the officers and their staffs,

Mr. A. G. Burney proposed, and Mr. Kenneth Mackay seconded, a cordial vote of thanks to the Chairman and Directors.

The Chairman, on behalf of his colleagues and himself, tendered the shareholders sincere thanks. He had said, and he meant it, that it was very necessary for the Board to have this encouragement in the arduous and anxious times in which they were now engaged in carrying on the business of the Company, and endeavouring to promote the interests of all concerned.

Extraordinary General Meeting—New Articles of Association.

An Extraordinary Meeting was then held for the consideration of the following resolution:

That the regulations contained in the printed document submitted to the meeting, and for the purpose of identification signed by the Chairman and the Secretary, be and the same are hereby approved, and that such regulations be, and they are hereby, adopted as the articles of Association of the Company to the exclusion of, and in substitution for, all the existing articles thereof.

The Chairman said the present Articles of Association of the Company were drafted in the year 1861. Since then from time to time important modifications in the government of limited liability companies had been enacted by law; and the Board had for some time felt that it was absolutely necessary the Company should have new Articles of Association that would be more in harmony with existing legal enactments. Also for the smooth working of the Company it was very desirable that certain omissions in the present articles should be replaced by some definite clauses that would make the powers in certain respects clear and legal. For instance, he might remind the shareholders that, in order that they might expend some money on war charities, the Directors had had to risk, at ordinary general meetings, for the shareholders' consent and approval to this. He believed, as a matter of law, although the shareholders consented to take a certain amount of responsibility, it did not make the gifts any more legal, because there was no power in the present articles to expend money in these directions. The articles he submitted for approval were the result of the most careful and painstaking drafting he had ever known. Their Solicitor, Mr. Mannings, had had many interviews with him (the Chairman) and Mr. Brookes. They had had successive drafts; and they had had the benefit of the assistance of a barrister with special experience in this matter. In the result, they had prepared as complete and workable Articles of Association as were in existence at the present moment. The shareholders would not wish him to go through them in detail; but he might mention that, wherever the shareholders' rights were concerned, they had enlarged them in the new articles—that was to say, they had endeavoured in any alterations that had been made, in regard to the shareholders' rights and privileges, to ensure that they were to their benefit. For instance, by the present articles, no shareholder could attend a shareholders' meeting unless he held five shares, and had held them for six months. Now this was very drastic and unusual. Under the new articles, any shareholder could attend a meeting; but he must hold three shares, and no time of holding was specified, in order to take part in the proceedings and vote. They had also taken power to hold annual meetings. The present articles compelled them to hold half-yearly meetings. What had occurred at Hull had brought him to the

conclusion (it was a matter upon which he had had an open mind) that, in the case of large industrial companies, twelve months' working was a safer and truer criterion of a company's position than a half year's. It did not necessarily follow that, because in the articles the Company could meet yearly instead of half yearly, they would do so. Speaking for himself, he had always endeavoured to carry out what he had reason to suppose were the wishes of the influential body of shareholders. If the shareholders expressed any definite wish to have half-yearly meetings, he did not suppose the Directors would demur to it; there was no obligation to hold annual instead of half-yearly meetings. He was told that the question of Directors' fees was one that interested the shareholders. He could only say the Directors had left them at what the shareholders had put them at. The Directors were not thinking of making any change in a new draft. They would not think of making any alteration in the remuneration fixed six months ago. These terms of remuneration had been embodied in the new articles. He might repeat that the new articles had been drafted with an exceptional amount of care and attention; and he warmly commended them to the shareholders for their adoption. If in course of time, the shareholders or the Directors should find anything that was distasteful, an extraordinary meeting could always be called to amend the articles in any direction in which experience proved them to be capable of amendment. The articles did not deal with the memorandum. The question of whether they should alter the memorandum was one that concerned not the shareholders, but the Courts. The Company would have to apply to the Courts; and after consideration, the Directors had come to the conclusion that the first thing to be done was to ask the shareholders to approve of the new articles. When once these had been approved and confirmed at a subsequent meeting, it would be necessary for the Court of Directors to take the opinion of counsel as to whether it was advisable to make any change in the memorandum to bring it into harmony with the new articles; but for the moment the meeting was exclusively confined to the draft of the new articles, regarding which he moved the resolution already read.

Major-General Corrie seconded the motion.

The Chairman remarked that he should have said that a copy of the new articles had been submitted to the Stock Exchange Committee; and, with the exception of a small addition to which the Board agreed, the Committee had entirely approved of the articles.

Replying to Mr. Charles Webb, the Chairman stated that the notice convening the meeting informed shareholders that they could see the new articles at any time within fourteen days preceding the meeting, at the different offices of the Company. When the articles were printed, there would be copies available; and any shareholder writing for one would certainly have a copy sent.

The resolution was unanimously carried.

The Chairman announced that the confirmatory meeting would be held on April 23.

ANGLO-PERSIAN OIL COMPANY, LTD.

NINTH ORDINARY GENERAL MEETING.

Very Satisfactory Report and Accounts.

The Ninth Ordinary General Meeting of the Anglo-Persian Oil Company, Ltd., was held on Wednesday last at the Registered Office, Britannic House, Great Winchester Street, E.C.—Mr. Charles Greenway (the Chairman and Managing Director) presiding.

The Secretary (Mr. F. Macindoe) having read the Auditors' report,

The Chairman said: Ladies and gentlemen, at the last annual meeting I expressed the hope that we might be able to accelerate the issue of our next report and balance-sheet. Unfortunately, owing to greater delay in the delivery of mails, shortage of staff, and other causes beyond our control, this hope has not been realized; but these difficulties are so well known to you all that I am sure no apology is needed. It gives me and the rest of the Board the greatest possible pleasure to present to you such a very satisfactory report and accounts as are before you to-day, as, although we are only at the initial stage of our developments, the results shown are such as more than to confirm the anticipations which we have always held out as to the great future which awaits this Company.

CAPITAL RESOURCES.

Dealing with the balance-sheet first of all, you will see that the paid-up capital shows an increase on the previous year's figures of one and three-quarter millions, due to the payment by His Majesty's Government of the final call on their ordinary shares and to the issue of a further £1,000,000 of participating preference shares; and we have also issued additional debenture stock to the extent of £1,800,000. You will, moreover, notice that our capital resources have been further augmented to the extent of about £2,400,000 by funds lodged with us by our associated companies, share premia, and allocations to reserve accounts. The deposits of our associated companies represent, I may explain, insurance recoveries in respect of torpedoed vessels, undivided profits, and other funds, the bulk of which will in due course be required in connection with the further capital outlay which lies before them for the various developments they have in view. It has been suggested in the Press that we may shortly have to make further capital issues. That is not so. Although we and our associated companies have a very large amount of new capital outlay to meet, in order to provide for the requirements of our rapidly expanding business, yet I am pleased to say that there is no immediate need for any new issue of capital, inasmuch as our available surplus assets to-day in cash or easily convertible securities (including no less than £2,302,000 invested in War Bonds and War Loans) amount to between five and six million pounds—a sum quite ample for our present requirements. Turning to the credit side of the balance-sheet, you will see that the first item of our assets has increased from £1,982,791 in the previous year to £7,001,375. This large increase is practically all accounted for by the purchase prices paid by us for the companies acquired in 1917, and by the fresh capital which we have taken up in these and other associated companies. The other items on this side of the account are all self-explanatory, and do not, I think, require any comments.

PROFITS FOR THE YEAR—THE GOVERNMENT'S SHARE.

I will now deal with the profit and loss account. The trading profit for the year amounts, you will see, to the very satisfactory sum of £1,516,994 3s. 9d., after making ample allowances for depreciation, as against the conservative estimate of not less than £800,000 to £1,000,000 which I gave when dealing with the previous year's accounts. A substantial portion of this profit was, I may explain, due to the earnings of our fleet, for a portion of which during the year under review we were able to find very remunerative employment. This item of profit will not recur in the following year's accounts, because during the greater portion of that year our boats were under requisition at rates which will barely cover running expenses; and also the profits of our distributing companies will be on a reduced scale. On the other hand, we shall benefit by a larger throughput at our Abadan refinery and by better prices which have been obtained for some of our products. On the whole, I think we can confidently anticipate results for the current year fully equal to those shown in the accounts now before you. As you will see from the appropriation statements given at the foot of the profit and loss account, we have out of our profits paid off the advances of £175,547 3s. 6d. made by the Burmah Oil Company in our early days. to enable us to pay the preference share dividend guaranteed by them, and also the sum of £45,843 10s. 5d. due to them for interest thereon; this latter amount being included in the first item on the debit side of the profit and loss account. We have also written-off the whole cost of our last preference share and debenture issues, and allocated a total of £330,000 to various reserve accounts, both of which steps will no doubt meet with your full approval. This leaves a balance of £779,708 18s. 1d., out of which we have paid dividends amounting to 8 p.ct. per annum on the preference shares; and we now recommend the payment of a similar dividend on the ordinary shares. The balance remaining to be carried forward will be £454,722 12s. 1d., which we estimate will amply suffice to cover the amount that will be payable in respect of excess profits duty, although the amount of this has not yet been definitely settled with the Revenue Commissioners. This result is, I think you will agree with me, one of which we have every reason to be proud. The dividend which we are proposing to declare on the ordinary shares is not a very large one; but, as I have explained, a great amount of our profits has been employed in the liquidation of special liabilities, which will not recur, and a further large amount has been reserved to meet excess profits duty—a liability which also we may hope will not recur for very much longer. It will probably interest you to know that the return to His Majesty's Government for the year on their investment in the Company, taking into account the amount they will receive from excess profits duty—the payment of which has only been made practicable by their investment in the Company—works out to something like 30 p.ct. per annum, and that, in addition to this, they effected a very large saving through the favourable long-term contracts entered into with the Company for the purchase of products.

LARGELY INCREASED PRODUCTION.

It will be borne in mind that these are results achieved at a time when the Company was only in its early infancy. With the various extensions already on the way, the throughput of our refineries will within the next year or two be trebled, and other extensions which we hope to arrange for in the near future should, when completed, bring our throughput up to five or six times the quantity dealt with in the year under review. As I have indicated on previous occasions, we anticipate no difficulty whatever in finding markets for this largely increased production. Our one and only difficulty is to provide refining, transport, and storage facilities fast enough to enable us to meet the demands upon us for our products. We have practically an unlimited supply of crude oil; and with the great increase in the demand for oil products of all kinds—resulting from the enormous development of motor traction in every part of the world, and for fuel oil as a substitute for coal for steam-raising and other purposes—there is endless scope for us in the direction of the sale of our products. But the laying of additional pipe lines, the building of further refineries and tank vessels, the erection of the great number of large storage tanks required at our fields, refineries, and distributing installations to meet our constantly increasing throughput, and all the other engineering work connected with an undertaking such as ours, is a slow process, particularly under present unfavourable conditions, both as to supply of material and labour. Consequently, it will be several years before we can hope to reach the maximum figure of throughput which I have just indicated. Though our throughput will, as soon as the necessary work can be completed, thus be very largely augmented, it must not be inferred that our profits will necessarily expand in the same ratio; for our working costs, due to the much higher cost of plant, stores, chemicals, and labour, are on a constantly increasing scale; and there is little chance of any appreciable reduction, in them for a long time to come. Still, by means of the larger turnover, a more complete extraction of the more valuable products contained in our crude, and other improvements which we are constantly introducing, we hope to some extent to be able to overcome the disadvantage of these higher working costs.

THE COMPANY'S SUPPLIES AND THE CONDUCT OF THE WAR.

While on this subject of outlets for our products, I would like, now that this is a subject which can be referred to without detriment to the military situation, to mention that, apart from the large quantities of fuel oil which we have been supplying throughout the war for the use of the Navy, we have been supplying the War Office with practically the whole of the requirements of the Mesopotamian Expeditionary Force for railway, motor, and other transport. It has become rather the fashion nowadays for industrial concerns and others to claim credit for "winning the war." We do not claim any such credit for this Company; but it may be claimed that, without these supplies, the conduct of the Mesopotamian expedition—at any rate, on anything like the scale which was eventually found to be necessary—would have been an impossibility, because it would not have been practicable under the

later conditions of scarcity of tonnage to have transported supplies from more distant fields. How far the Mesopotamian expedition has tended to bring about the successful conclusion to the war I will not venture to express an opinion; but, notwithstanding the attacks which were at one period of the war made on "side shows," I think it is generally admitted now that had this expedition not been undertaken our position in the East to-day would have been very different from what it is. The credit for this is, however, not due to us, but to the great foresight—which may now, in the light of our present knowledge of German pre-war aims, be regarded as almost providential—of Lord Fisher and Mr. E. G. Pretyman, who, in 1905, on representations made by the late Mr. D'Arcy, urged the Burmah Oil Company and the late Lord Strathcona to provide the necessary funds for carrying on Mr. D'Arcy's exploratory work to a successful issue, in order that the concession might not fall into foreign hands. This is a chapter in the history of this Company which is not very well known, and one which deserves to be placed on record now, in view of the important bearing which it undoubtedly had on the conduct, if not on the actual issues, of the war.

GREAT PRODUCTIVITY OF THE FIELDS.

I am pleased to report that the fields work carried on since I last addressed you further confirms the opinions we have previously held as to the great productivity of our fields. The wells in the field from which we have hitherto been obtaining our production still maintain their extraordinarily high rate of yield; and the wells already drilled are, it is estimated, capable of yielding a production at the rate of 5,000,000 tons per annum. On the geld adjacent to it (to which I referred at the last meeting) another well, at a distance of about a mile from the preceding one, has struck oil in considerable volume; the well being reported upon as being equal to any yet struck in the Company's territories. In the third field, referred to in my last speech, little progress has since been made, owing to the lack of drilling material. But the prospects are still satisfactory. Testing operations are being carried on, or are about to be started, in a further six fields, all of which give promise of favourable results. You will also be interested to learn that we are now substituting electric for steam power in our producing fields—a change which will result in greater efficiency and a minimum of cost for drilling and producing generally.

REFINERIES.

Since I last addressed you, the first of the refinery extensions at Abadan (to which I then referred) has been completed and brought into operation. The further extensions, for which capital was issued a little over twelve months ago, have not yet been completed, owing to the great delay which has been experienced in obtaining delivery of plant; but they are now well in hand, and should be completed during the year. A further large addition at Abadan has now been decided upon to enable us to meet the rapidly growing demand in the East for our fuel oil, and will be undertaken as soon as plant can be contracted for at reasonable prices and delivery. In addition to our extensions at Abadan, we have now commenced the erection of a large refinery near Swansea, where the refining of such products as are marketable in the United Kingdom can be carried on more thoroughly and more economically than at Abadan. The work at this refinery, the initial capacity of which will, I may mention, be twice that of the whole of the Scotch shale oil companies, is being executed with all possible speed.

PIPE LINES.

The additional pumping stations referred to by me at the last meeting are now in course of erection, and should be in operation during the course of this year. We have also decided upon the laying of an additional 10-in. line from the fields to our present 8-in. line, in place of the present 6-in. line, which will further considerably augment our pipeage capacity between the fields and the Persian Gulf. We shall, when this line is completed, have one complete 10-in. line from the fields to the Gulf, and another line made up of 10-in. pipe for about half the distance and 8-in. for the remainder.

THE COMPANY'S INCREASING FLEET.

Our fleet now amounts to a total dead-weight capacity of 162,000 tons; and, as mentioned in the report, we have placed orders for further vessels of a total capacity of about 150.000 tons. We also purpose purchasing further ready tonnage whenever opportunities occur for securing it at reasonable prices. All of our vessels which were requisitioned by the Shipping Controller have now been released; and such as are not required at the moment for our own transport work have been chartered at remunerative rates.

RELATIONS WITH THE PERSIAN GOVERNMENT.

I am pleased to say that the political situation in Persia has improved very much during the past few months. The present Persian Cabinet is well disposed towards this country; and the unrest which existed some time ago as the result of German and Turkish intrigue, followed by the spread of Bolshevism from the Caucasus, has now largely disappeared. Our relations with the Persian Government continue to be of a friendly character, and a representative of the Company is now in Teheran discussing with them the settlement of various questions which are outstanding between us. I was hoping to be able to announce to-day the result of these discussions; but so far no advice has been received. I wish to take this opportunity of expressing our regret at losing the valuable services of His Excellency Sadigh-es-Sultaneh, who is giving up his post of Imperial Commissioner to this Company to take up the more important position of Minister of His Imperial Majesty the Shah at the Court of Washington. At the same time the Board would like to offer him their heartiest congratulations upon his new appointment. Our relations with His Excellency have always been of a most friendly and cordial character, and we are greatly indebted to him, because he has always done his best to promote the interests of the Company as well as those of his Government. His brother, Farid-es-Sultaneh, has been appointed by the Persian Government as his successor; and I am sure, from what he has said to me, that he will do his utmost to maintain the policy of friendly co-operation established by his brother.

A TRIBUTE TO THE STAFF.

Before concluding, I should like to pay a tribute again to our staff, both here and in Persia, for the good and loyal work which they have rendered to us, and for the sacrifices they have made during the past year, under conditions which have become more and more trying. It has been quite impossible under war conditions to secure a staff commensurate with the development of our business; and this has meant overwork for everyone, and also in many cases the postponement again and again of leave which was long overdue. Moreover, owing to the restrictions on building work in Persia, it has been impossible for us to provide adequate housing accommodation for our staff there; and this has resulted in a good deal of discomfort. Notwithstanding these trials and discomforts—which, happily, we shall now shortly be able to overcome—there have been very few complaints indeed; and I am sure you will agree with me that the staff are entitled to our warmest thanks for performing their services so satisfactorily under these extremely trying conditions.

EMPLOYEES' PROFIT-SHARING SCHEME.

Now that the Company has arrived at a remunerative stage, it has been decided to allow the employees of the Anglo-Persian Company and of all its associated companies to share in the prosperity of the Company by establishing what we have designated as a "Provident Pension and Insurance Fund." In this fund three separate accounts are kept: (*a*) To which the employee subscribes 5 p.ct. of his salary; (*b*) to which the Company contribute a bonus of a corresponding amount; and (*c*) to which the Company contribute from year to year out of their profits such sum as the Board may deem advisable. On the whole of these accounts the Company allows interest at 5 p.ct. per annum. The money at credit of (*a*) and (*b*) accounts can be drawn on an employee leaving the Company's service or at certain fixed periods if he remains in the Company's service. In the latter case, he can, when he retires, leave the whole or any portion on deposit with the Company up to the time of his death, meanwhile drawing interest thereon. The money at the credit of (*c*) account will be accumulated till the employee has completed twenty years' service in the case of employees engaged on home service and shorter periods for those engaged wholly or partly on foreign service, after which the employee will be entitled, whether he retires or remains in the Company's service, either to draw as a pension the interest on the amount at credit (leaving the principal in the hands of the Company for the benefit of his family or such persons as he may direct after death), or to leave the interest to be added to the principal for similar disposal. The fund, to which all British employees, both male and female, and certain non-British employees, are eligible for membership, affords a means of enabling the employees to share in the profits of the Company, and it at the same time ensures a substantial pension after retirement and a considerable capital sum—the equivalent of life insurance—for the benefit of their families after death. The scheme has been heartily welcomed; and already over 1500 employees have applied for, and been admitted to, membership.

I now beg to move: "That the report of the Directors, the balance-sheet, and the profit and loss account for the year ended March 31, 1918, be received, approved, and adopted." I will ask Sir Frederick Black kindly to second this motion.

SPEECH OF ONE OF THE GOVERNMENT DIRECTORS.

Sir FREDERICK W. BLACK, K.C.B.: I have very much pleasure in seconding the motion which the Chairman has proposed. As one of the Government *ex-officio* Directors representing the Admiralty on the Board of the Company, I should like to be allowed to say just two or three words of congratulation to the Chairman, the Directors, the shareholders, and the employees of the Company, on the highly satisfactory results that have been achieved and on the excellent prospects that evidently lie before you. The Company displayed very great energy and promptness in all the developments that were necessary at the refineries, the pipe-lines, and the means of transport to handle a much larger proportion of oil, so that the British Navy might receive from this source one of its most vital supplies. During the war the contributions of oil, particularly to the Fleet in the Mediterranean, which we received from Persia, were of the very highest importance. I do not think that the Chairman has said a word too much as to the importance of the supplies that were made to the expedition on the Tigris. He has called it a "side show." But, as you know, it was one of those side shows that eventually had a most important influence on the final issue of the war. It was not only the oil supplies that were made from the Persian fields, but also the very great help that was given by the Company in putting the services of its employees, slipways, and workshops at the service of the Government in the construction and repair of vessels which were used in the expedition. I had the pleasure of coming home from India in 1917 with Captain Grant, who had been up there as the Admiralty representative on this work, and on board also was Mr. Neilson, your Superintendent at Abadan. Captain Grant was very loud in his praise of what Mr. Neilson and all the employees of the Company had done to assist the Government in this very important matter. I think, therefore, the words that the Chairman has used in commendation of the services of the employees are particularly well deserved. Perhaps I may mention incidentally that I saw some Diesel engines running very sweetly in Bombay; and when I looked round for the tank of oil, I was told that it was oil that came from Persia. I learned that the Persian oil was making a good name for itself in Bombay. I congratulate you on the success of the Company.

Mr. CARTER: I should like to ask to whom the £1,800,000 of debenture stock was issued. I take it that it was to the Government; but it is not stated so in the report. This amount was added to the previous £600,000. In the event of the drawings which, I understand, are to take place from 1920, will this £1,800,000 share in the drawing? There is £20,000 to be drawn each year. Will the £20,000 only refer to the £600,000, or will it refer to the whole £2,400,000?

The CHAIRMAN: In reply to the questions which have just been put, the answer is, first of all, that the £1,800,000 additional debenture stock has been issued to one of our subsidiary Companies—the British Tanker Company. As regards the other question, the £1,800,000

ranks *pari passu* with the £600,000 previously issued, and, of course, will be redeemed correspondingly.

The resolution was then carried unanimously.

THE DIVIDEND.

The CHAIRMAN: The next business before the meeting is the declaration of a dividend on the ordinary shares; and I now beg to move—"That a dividend at the rate of 8 p.ct. per annum, free of income-tax, be paid on the ordinary shares in respect of the year ended March 31, 1918, and that such dividend be paid on April 30 next." I will ask Mr. Cargill kindly to second this motion.

Mr. JOHN T. CARGILL seconded the motion, which was unanimously agreed to.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The CHAIRMAN: The next business before the meeting is the election of Directors. As you will see from the report, Sir Campbell K. Finlay was unfortunately compelled, owing to the exigencies of his Government work, to resign his seat on the Board, and Mr. Robert I. Watson, whose great knowledge of the oil business in all its branches, and conspicuous ability, will be of great advantage to the Company, was appointed to fill his place. A further appointment, to fill the seat rendered vacant by the death of Mr. D'Arcy which has been made during the past year, is that of Lord Southborough, whose great ability and long experience of oil questions at the Admiralty, from what may be described as the Imperial point of view, will also undoubtedly be of great benefit to the Company. Both of these gentlemen, who now retire under clause 82 of the Articles of Association, are valuable acquisitions to the Board; and I am sure that you will heartily support their re-election. The Directors retiring by rotation are Mr. F. W. Lund, Mr. Frank C. Tiarks, and Sir Trevedyn Wynne. All of these gentlemen have done extremely good work for the Company; and I am sure that you will desire to retain their services.

THE GOVERNMENT REPRESENTATIVES.

I would also like to take this opportunity of expressing the pleasure we all feel at welcoming to the Board Sir Frederick Black as one of the Government representatives. Sir Frederick has for many years dealt with oil matters at the Admiralty as Director of Contracts—much to the advantage of the nation, as I know from personal experience; and I am sure that his co-operation on the Board will be of great service to the Company. I would like at the same time to express our appreciation of the valuable services rendered to the Company by Mr. Jenkins—who I am glad to see present—during the time that he was on the Board as a representative of the Government, prior to the appointment of Sir Frederick Black. Another reference which I must make to the Government representatives is to express our regret at the absence from to-day's meeting of Lord Inchcape, and at the unfortunate cause thereof. We all know the great services which Lord Inchcape has been rendering to the nation; and I am sure you will all join with me in wishing him a speedy restoration to health in order that he may once more be able to resume his herculean labours on behalf of the country. I now beg to move—"That the election to the Board of Mr. Robert I. Watson and of the Right Hon. Lord Southborough be confirmed, and that Mr. F. W. Lund, Mr. F. C. Tiarks, and Sir Trevedyn R. Wynne, who retire by rotation, and are eligible for re-election, be and are hereby re-elected members of the Board."

Admiral Sir E. J. W. SLADE, K.C.I.E., K.C.V.O., seconded the resolution, which was unanimously carried.

The CHAIRMAN: The next business of the meeting is to elect Auditors; and I shall be obliged if two of the shareholders present will kindly propose and second the necessary resolution.

Sir J. D. REES, M.P., proposed—"That Messrs. Brown, Fleming, and Murray be re-elected as Auditors for the financial year 1918-19, at such fee as may be determined by the Board."

Mr. POWELL seconded the motion.

The CHAIRMAN: Before putting this resolution to the meeting, I should like to pay a tribute to Messrs. Brown, Fleming, and Murray for the very efficient manner in which they have carried out their audits. I am pleased to say that they have now opened a branch in London in order that they may be able to render their services still more effective to the Company.

The motion was carried unanimously.

A cordial vote of thanks to the Chairman terminated the proceedings.

Conway Gas-Works without Coal.—Urgent messages were sent to the Coal Controller some days ago, when the supply of coal at the Conway Gas-Works was exhausted, and the gas-engine at a large printing works in the town stopped through insufficient pressure.

Gas-Workers' Wages at Torquay and Exmouth.—The Court of Arbitration have given their award in the matter of the gas workers' wages at Torquay and Exmouth. The parties to the reference were the Torquay and Exmouth Gas Companies and the Dock, Wharf, Riverside, and General Workers' Union. The claim submitted was that the agreement between the National Federation of General Workers and representatives of gas undertakings of Oct. 1, 1918, should apply to members of the Dock, Wharf, Riverside, and General Workers' Union in the employ of the Torquay and Exmouth Gas Companies. Representatives of the Union were heard on Feb. 20 last, and written statements were submitted by the employers. By the agreement referred to, there was granted an advance of 3s. 6d. a week to men 18 years of age and over, and 1s. 9d. to boys and youths under 18. The award of the Court is in the following terms: The men concerned, aged 18 years and over, shall receive an advance of 3s. 6d. a week, payable at the rate of 7d. a day or shift for each day or shift worked. Boys and youths under 18 years of age shall receive an advance of 1s. 9d. a week, payable at the rate of 3½d. a day or shift for each day or shift worked. The rates in force on Nov. 11, 1918, as modified by the advances provided for in the two foregoing clauses shall be, and shall be deemed to be, the substituted rates of wages for the purposes of the Wages (Temporary Regulation) Act, 1918. The award shall take effect as from the beginning of the first full pay following Dec. 1, 1918.

PRIMITIVA GAS COMPANY OF BUENOS AIRES, LTD.

A War Time Fall from a Strong Financial Position—The Chairman Visiting Buenos Aires.

The Annual General Meeting of the Company was held last Tuesday, at River Plate House, Finsbury Circus, E.C.—Mr. A. E. BOWEN, the Chairman, presiding. In opening the proceedings, the Chairman mentioned that it had not been expected that the Board would have been able to call the shareholders together until the middle of next month. But he had decided that, in the interests of the Company, it was necessary for him to go to Buenos Aires as early as possible; and he had decided to leave England for the purpose on [last] Saturday.

The SECRETARY (Mr. J. M. Macmorran) read the notice calling the meeting; and the Directors' report and the accounts were taken as read. The report gave an account of the financial position that will be found dealt with in the Chairman's address. It also mentioned that, gas coals having been unobtainable, except with the greatest difficulty and at an exorbitant price, only 11,731 tons were used. The Company had been obliged to turn to any available substitutes and had carbonized 107,730 tons of timber, 26,758 tons of cereals, 3368 tons of bones, and 3325 tons water gas oil and crude petroleum, or a total of 152,912 tons, as against 158,991 tons in 1917. But the increased cost of fuel was no less than £97,073 over that of the previous year. It had been impossible to arrive at any settlement with the Municipality, which owed the Company £135,693 on Dec. 31, last, when the public lighting was closed-down with the exception of the hospitals.

"A DEPLORABLE CONDITION OF AFFAIRS."

The CHAIRMAN, in moving the adoption of the report and accounts, said his address last year was pessimistic; and the shareholders were no doubt pretty well prepared by Press notices for a very bad balance-sheet this year. It was no use hiding the fact that it was almost as bad as it could possibly be. The Company had made an actual loss of £50,836 on the working in Buenos Aires, and had had to meet, in addition, £83,373 for debenture interest, sinking funds, and London office expenses. So that the actual debit balance for the year was £102,465, after deducting profit on exchange, and £11,417 obtained from relief of income-tax—a truly deplorable condition of affairs, as it brought up the total debit to profit and loss to £128,601. But this statement, bad as it was, did not fully show the extent of their misfortunes. The preference dividend was in arrear to the extent of £375,000. The Retiro amortization (which it was calculated in their fairly prosperous years required a provision of £35,000 per annum) was £140,000 in arrear. They had lost all their working capital; and on Dec. 31 last, they owed their bankers in Buenos Aires £72,114. At the same date, the Municipality owed the Company £135,693. But the authorities refused to pay any interest on their debt, while the Company had to pay their bankers interest at the rate of 7 p.ct. per annum. In addition, they had in suspense account the sum of $152,730 (say) £13,333 for the costs of the arbitration award, to which he alluded last year. The pension fund had been quite exhausted; and they had not been able to provide anything for depreciation and for other things which the Board would have liked to write-off to profit and loss.

WHY THE PUBLIC SUPPLY WAS CONTINUED SO LONG.

The shareholders would naturally be inclined to ask why, under these circumstances, the Directors carried on so long as they did; and, of course, the reply was that, in accordance with the arbitration award, they hoped, and endeavoured by every possible means to secure, that the authorities would allow them to increase the selling price of gas, and would make some effort to liquidate their indebtedness to the Company. But he was sorry to say that nothing whatever had been done; and the situation was precisely the same as it was when he last addressed the shareholders, with the exception that the Board were compelled to close-down the municipal services, other than for the hospitals, on Dec. 31 last, owing to absolute want of money to sustain the enormous losses the Company were suffering, of about $5000 per day. The municipal gas lighting was still closed-down; but the authorities had been able to light some portions of the district with electricity, kerosene, alcohol, &c.

INTERVENTION OF THE BRITISH MINISTER.

The Directors had had several letters from shareholders asking whether the British Foreign Office could not help the Company. The authorities had given every possible assistance; and the best thanks of the Company were due to the British Minister in Buenos Aires—Sir Reginald Tower—for his whole-hearted endeavours to obtain justice for the Company. He approached the President of the Republic, and obtained from him a promise to send an emergency law to Congress, by which the Company would be allowed to increase its selling price. But nothing was done. Sir Reginald also intervened with the Lord Mayor; but all he was able to obtain was a suggestion that the Company should hand over the works for some weeks to the technical advisers of the Municipality, who thought they could manufacture gas very much cheaper than the Company could, and so prove that an increase in the selling price was not necessary. As these technical advisers were responsible for the statement made before the Arbitration Court, that it had been the practice of the Company to inject superior quality gas into the mains where the official testing-stations were situated, so as to deceive the officials as to the calories that were being supplied to the consumers, the shareholders could easily imagine that the Board absolutely declined to give up the management of the property to these people. They, however, offered to allow a committee of the gas managers in the Republic to fiscalize the working for any reasonable time, and to abide by the result they obtained. This, of course, was not accepted, because it was fairly evident that the object of the authorities was to bring the Company to absolute ruin. And they

had almost succeeded. Why it should be their desire to do this, he (the Chairman) was going to Buenos Aires to find out.

WHAT IS THE OBJECT OF THE MUNICIPALITY?

His (the Chairman's) reasoning was that a great city like Buenos Aires must have gas. They were the only gas company in the city. They had served the community well and faithfully for over fifty years; and the authorities were not likely to find anybody to step into the Company's very ruined old shoes. It would cost to-day at least 150 p.ct., perhaps 200 p.ct., more to put in their 1138 miles of mains, and the gasholders and machinery; and, after their experiences, he was sure nobody would be found to risk money in any such mad enterprise. It might be, of course, that the idea of the people who were working against the Company was that the Municipality would be able to take over the property at old-iron prices. But the Company had a concession in perpetuity from the Provincial Government which before 1880 owned the City of Buenos Aires. It was his opinion that it would be many years before the Courts would allow the Municipality to confiscate the Company; and during that time they would be without a gas supply.

IF THE CHAIRMAN'S VISIT IS UNSUCCESSFUL THEN THE ONLY REMEDY—LIQUIDATION.

However, he was going out to see what could be done. He was not at all hopeful, as the forces working against the Company were very strong. But he would do his best; and they would let the shareholders know, as soon as he had been able to thoroughly survey the position, the conclusions he had come to. They might possibly ask why he had not gone out earlier; but it would have been useless. The Intendente—the Lord Mayor—could do little to help even if he were so inclined, because a Municipal Council was not in existence; and he was able always to shelter himself behind this fact. The Council was only elected and began its sittings in January last. Although the City was the Federal Capital, and the Lord Mayor was elected by the President of the Republic, his acts were supposed to be fiscalized by the Municipal Council, which, as he said, did not exist for the last three years. They had a cable that morning saying the ordinary session of the Council had been prorogued to April 30; and that a favourable result would then be obtained. But they had heard this for the last three years. If he was not able to obtain a settlement of the municipal debt, and a sliding-scale of selling prices of gas based on the cost of coals, they would have no remedy but to put the Company into liquidation, as they had lost their working capital, and the bankers were not likely to allow the Company to much increase their indebtedness to them. They had no money with which to buy coals, now that they could be obtained to some extent; but, as a matter of fact, the substitutes they had been using were still cheaper than imported coals. Perhaps the only bright spot in a very drab situation was that they made a profit of £128,696 from the chemical business; and this would have been considerably increased if they had been able to carbonize more coals.

SEVENPENCE FARTHING LOST PER 1000 C.FT. OF GAS MADE.

The suspension of the public lighting would reduce the fuel bill by over 100 tons per day, and some $40,000 paper wages per month. The average cost of coal in 1918 was £7 10s. 6d. per ton; and in 1917 £4 11s. 9d. per ton—an increase in 1918 of £2 18s. 9d. per ton. During the past year, the bad debts decreased to £9562—practically half of the 1917 figures. The outstandings in Buenos Aires at Dec. 31 were $113,447 paper; and as the accounts issued to private consumers during December amounted to $416,763, they had every reason to be satisfied with the collections other than the municipal accounts. The decrease in the quantity of gas made was 2·713 p.ct.; gas sold, 2·328 p.ct.; and in cash received, 5·454 p.ct. An actual loss was incurred of 7¼d. per 1000 c.ft. on all the gas made.

THE ACCOUNTS EXAMINED.

Turning to the balance-sheet, there was no alteration of the share capital items. The sinking fund operations had reduced the amounts of the first debentures and "River Plate" and "Buenos Aires (New)" debenture stocks outstanding. This year the amount of the bank overdraft—£72,115—was shown separately. Sundry creditors, therefore, stood at £140,972, as against £161,226 in the previous year. As to the sinking fund accounts, "River Plate" and "Buenos Aires (New)" debenture stocks were increased to £63,438 by the sinking-fund operations referred to. The general reserve account was unaltered. Land, buildings, plant, machinery, and mains account showed a reduction of £1962 from last year's figures. Sundry debtors and debit balances were up £12,634—from £308,686 to £321,320—this including the £135,693 owing to the Company by the Municipality, which had been taken as good. The stocks of fuel and stores were £479,358, as against £498,396 in 1917—a reduction of £19,038, due chiefly to the impossibility of shipping coal. The Retiro amortization account was the same as last year—viz., £644,329. Bills receivable were £7109, as against last year's figure of £5205—an increase of £1904. The cash at bankers and in hand showed a reduction of £34,707—from £73,318 to £38,611. As the shareholders were aware from the notices in the papers, grave labour troubles had been prevalent in Buenos Aires during the year. So far the Company had not been obliged to increase the wages of their men; but the Directors had promised to do so when granted an increase in the selling price of gas.

Mr. H. E. Jones, in seconding the motion, said the shred of comfort in their proceedings had been the announcement by the Chairman—perhaps the most energetic and influential Chairman any gas company possessed—that he was going to Buenos Aires, where the Company had had, since the beginning of the war, nothing but troubles and disappointments. The shareholders might expect something from him (Mr. Jones), he having had a long experience of gas supply, under circumstances which up to the war had always been exceedingly prosperous. Even in London to-day, all gas dividends were down to the miserable point of 2¾ and 3 p.ct., having been formerly 5, 6, and 7 p.ct., or thereabouts. Coal had advanced by shillings per ton in London; but owing to restrictive freights, the operations of submarines, and so on, the cost had gone up pounds per ton in Buenos Aires. The Directors had been disappointed that, whereas the residuals of coal as a rule followed—not merely the chemicals, which were so valuable in Buenos Aires—the price of coal, coke had not realized anything like the proportion of compensation that they should look for. The reckless disregard by the authorities of their legal and moral obligations under the award of the Arbitrator—had made it quite impossible to see where the Company were to get any remedy. Short of some national collision, it seemed the Company were debarred from ordinary legal remedies which existed in most civilized countries. There was yet another crumb of comfort—that their works and mains were of a value that day higher than they were before the world war. They could not now be replaced for a great deal more than they stood at in the capital account. If the supply of gaseous fuel was of any value to any community at all, it was of value in Buenos Aires, as to the rest of the world. Openly and patently, the Company's works would be required as certainly as he stood there that day. If they were of that value—short of confiscation if their national prestige was gone and the Company could not get justice—the value would remain to the Company in the future. Their capital would remain; and it was as great as, or greater than, it was when they originally put up the works. This being so, he could not help thinking that, if their Chairman used the great energy, influence, and capability that he always showed (as they knew he would do), the shareholders ought to have some reparation through him. The Directors kept getting from the Plate promises of this and promises of that; but up to now they had ended in very little. When they asked their Solicitor what remedy the Company possessed, he practically told them that in Buenos Aires there was a state of anarchy and a state of paralysis of trade; and it was almost impossible to get any remedy. The Board found the greatest satisfaction and comfort in the knowledge that the Chairman was going to put himself on the spot, and in touch with all these questions. Never before in his (Mr. Jones's) forty years' experience had he met a body of gas shareholders with a report like this.

Mr. W. H. Skeel said the Chairman would go out with the full confidence of the shareholders; and they wished him a safe voyage and a safe return, with good news.

The Chairman said he would do his best; and he hoped to be able to send a cablegram saying the Company were to get more on the price of gas.

The motion was unanimously carried.

The retiring Directors (Mr. C. P. Ogilvie and F. C. im Thurn) were re-elected Directors. The Chairman mentioned that Mr. Ogilvie was also proceeding to Buenos Aires.

The Auditors (Messrs. George A. Touche & Co.) were re-appointed.

The Chairman moved a vote of thanks to the staffs in Buenos Aires and London. They had had a very bad time here; but it had been very much worse in Buenos Aires. There negotiations with the Municipality had been continuous all through the year; and the enormous difficulties of finding adequate supplies of fuel had been such as to almost drive their General Manager (Mr. W. Angus) crazy. At one time they had less than a day's supply in the works. The shareholders would see by the report that they had carbonized almost everything they could lay hands on—old bones, maize, bran, timber, and other things; so it could be imagined the life Mr. Angus had been living. Mr. Macmorran and his staff had hustled to get out the report and accounts, which were posted only two days after the Buenos Aires figures reached London.

Mr. Oswald seconded the motion, which was unanimously carried.

A cordial vote of thanks was also passed to the Chairman and Directors.

SOUTH METROPOLITAN CO-PARTNERSHIP SCHEME.

A column of yesterday's issue of the "Daily Telegraph" was occupied by an interesting description, by their Labour Correspondent, of the inception, operation, and results of the South Metropolitan Gas Company's co-partnership scheme, the thirty years' experience of which, it is remarked, shows "that an equitable scheme of co-partnership gives contented, loyal workers." For the facts which he quotes, the writer of the article acknowledges his indebtedness to Mr. Charles Carpenter, D.Sc. (the Chairman of the Company), who, he says, "was the late Sir George Livesey's lieutenant when the scheme was launched in 1889, and who has continued and expanded its operation from a keen appreciation of its merits and of the good results which have flowed from it to the workers and to the Company." The following extract is taken from the article:

When the scheme was started in 1889, it provided for the payment in cash of 1 p.ct. on salaries and wages for each 1d. at which the Company could sell gas below 2s. 8d. per 1000 c.ft. The scheme was revised in 1894, when the bonus was increased to 1½ p.ct. for each 1d., and was again revised in 1901; the initial price of gas being raised to 3s. 1d. per 1000 c.ft., and the bonus reduced to ¾ p.ct. for each 1d. at which gas was sold below the basis price.

A Committee of Management of thirty members (including the Chairman of the Company) elected by the Board, and thirty members elected by ballot by the co-partners, administer the fund. Each year the amount of bonus to which the workman is entitled becomes his own absolute property; but one-half is invested in the Company's ordinary stock and the other half entered in the employee's pass-book, upon which interest is paid, but which he may withdraw upon giving seven days' notice. Altogether, in these thirty years, the workmen have received nearly £1,000,000, of which between £400,000 and £500,000 remains invested in the concern. The rate of bonus earned has fluctuated considerably. Beginning at 5 p.ct. on salaries and wages, and giving a modest £6037 to the workmen, it has ranged from 3, 4, 6, 7½, 8, up to 9¾ p.ct. In 1914, which I take as the war year, the bonus was 8¼ p.ct., and the payments under the scheme £49,189. Gas making has not been one of the profiteering industries. In 1916 the bonus dropped to 2¼ p.ct.; in 1917 it rose to 3¾ p.ct.; and in 1918 there was no bonus to distribute. Thus the workmen have passed through the lean years as well as the fat years. Yet I was

assured by Mr. Carpenter, and also by one of the Workmen Directors, that the spirit of goodwill and of loyalty to the communal interest of the concern is as good to-day as in the most prosperous times.

Thus the co-partnership system has educated the men who have come within its influence to a loftier conception of their duty to their fellows and to the State. This great Company have given upwards of 3000 of their employees to the service of the country during the war. Many of these men, on military service in the various theatres of war, have told their soldier comrades of this co-partnership scheme, and extolled its merits to others; and the Company have as a consequence received applications from soldiers desirous of entering their service on demobilization.

The operation of Sir George Livesey's scheme has developed character; it has enlarged outlook; it has given the workman a sense of personal respect; it has made him a co-partner in the profits of industry; it has impressed him with some of the difficulties of management and of control which are the inseparable burdens of great commercial undertakings. Along with all this, it has broadened his sense of public duty and of national patriotism. These are great achievements, and they are achievements possible in many other great industries, and equally pregnant with the promise of a new and better spirit in the relations between capital and labour.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 31.

The London tar products market remains fairly quiet; prices for pitch and creosote being maintained as last quotation. Some quantity of the latter has been now exported. There is a little inquiry for solvent naphtha, and the price is reported at 2s. 6d. to 2s. 7½d. per gallon. Benzol is being freely used as a motor fuel.

Sulphate of ammonia remains unaltered.

Tar Products in the Provinces.

March 31.

There has been little alteration in the market for tar products during the past week. Pitch well maintains its value in London and on the east coast, but is reported to be rather easier on the west coast. Benzols are still unchanged, and are, of course, being freely sold for motor purposes. Solvent naphthas are easier, and prices have a tendency to depreciate all round. Carbolic is still to all intents and purposes unsalesale; and in the majority of cases manufacturers have entirely ceased its production. Creosote oil is steady at previous figures; while for heavy oils there is a good demand. Naphthalene is very dull indeed; and there is practically no business done.

The average values for gas-works products during the week were: Gas-works coal tar, 34s. 9d. to 39s. 9d. Pitch, East Coast, 50s. to 51s. per ton f.a.s.; West Coast—Manchester 42s. 6d. to 45s., Liverpool 45s. to 46s., Clyde 46s. to 46s. 6d. nominal. Benzol 90 p.ct., North, 1s. 10d. to 1s. 11d.; 50-90 p.ct., naked, North, 1s. 9d. to 1s. 11d. Toluol, naked, North, 2s. to 2s. 3d. nominal. Coal tar crude naphtha in bulk North, 8d. to 8¾d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 4d. Heavy naphtha, North, 2s. 8d. to 2s. 10d. Creosote, in bulk, North, 5d. to 5¾d. Heavy oils, in bulk, North, 6d. to 6¾d. Carbolic acid, 60 p.ct. unsaleable. Naphthalene, £25 to £30; salt, £6 to £7, bags included. Anthracene, "A" quality, 6d. to 7d. per minimum 40 p.ct.; "B" quality, 2d.

Price of West Coast Pitch.

Our correspondent writes to point out that, under the heading of "Tar Products in the Provinces," the price of West Coast pitch, in the "Journal" for March 18 was, by a clerical error, given as 45s. to 50s., whereas he should have put it at 45s. to 46s.

Manchester District Tar Prices.

The average price realized for tar in the Manchester district, based on the value of the products, for the month of February was £2 6s. 7d. per ton.

FROM A MARKET CORRESPONDENT.

Tar Products.

There is very little alteration to be noted in the tar product markets during the past week. Anxiety as to the coal strike was in evidence in the early part of the week; but with the more settled industrial aspect at the week-end, the business position seems to have improved. The question of the moment, however, is how far nationalization of the coal mines, if it comes, is likely to affect the bye-products trade. The demand for pitch seems about as usual, with Provincial rates still inclined to harden, especially on the East Coast, where sellers have lately been able to advance their quotations very considerably. On the West Coast, some incentive is needed before makers can follow suit, such as better transport conditions or a large demand for road making. This latter, somehow, seems to hang fire; but it must surely come along soon. Creosote remains a firm spot, and a further advance is being looked for by those in a position to judge conditions. Toluol is dull and lower. Benzol is steady without any definite change in quotation, although there are attempts at under-cutting. The formal entry of all producers to the recently-formed Association is not yet completed. Solvent naphtha is very flat, and the rubber industry does not appear to be taking much interest in the product. In spite of the slackness, however, prices have not given way very much. Heavy naphtha is inclined to drag. Naphthalenes are weak, and on the way down to pre-war quotations. In carbolic acid, there is still practically nothing doing; and it is difficult to forecast the outcome of present difficulties. Some crude must be made, of course; but at the present nominal quotation of 1s. it cannot pay, and makers do not care to accept orders. Crystals have been offered in small retail lots at 6d. per pound; but the nominal bulk quotation is 4d. Other products are without feature.

The range of home quotations is as follows:

Benzol: 90% London, 2s. 1d. to 2s. 3d. per gallon; 50-90%, 1s. 11d. to 2s. 2d. per gallon.

Carbolic Acid: Crude 60's unsaleable; crystals, 40%, 4d. per lb. asked.

Crude Tar: London, 40s. to 41s.; Midlands, 34s. to 36s.; North 35s. per ton *ex* works.

Pitch: London, 65s. to 70s. per ton; East Coast, 49s. to 52s. per ton; West Coast, 44s. to 45s., with Manchester 42s. per ton and Glasgow 47s. 6d. per ton; South Wales, 53s. per ton.

Solvent Naphtha: London, 2s. 6d. to 2s. 8d. Provinces average 2s. 4d. per gallon.

Crude Naphtha: Naked, 10d. per gallon.

Heavy Naphtha: 2s. 8d. per gallon.

Naphthalene: Refined, £20 to £22 per ton nominal; crude, £5 10s. to £10, according to quality.

Toluol: Naked, 2s. 1d. to 2s. 3d. per gallon nominal.

Creosote: London, 7½d.; North, 6¾d. to 7d.; heavy oil, 7d. per gallon in bulk.

Anthracene: 40-45%, 4½d. to 8d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 per ton f.o.r. makers' works.

Aniline Oil: 1s. 2d. per lb.

Cresylic Acid: 95%, 2s. 9d. to 3s.; 97-99%, 3s. to 3s. 3d. *ex* works London; f.o.b. other ports.

Sulphate of Ammonia.

Outputs are on the increase again, and there is no difficulty in disposing of all the production. Arrangements are in progress with a view to preventing any drastic movement in prices either one way or the other when control is removed. Whatever means are decided upon, somebody is going to be dissatisfied. Many interests declare that a higher price for sulphate is absolutely essential in the general interests of the whole business, and especially with a view to stimulating production. On the other hand, manufacturers know that the British farmer will protest against any higher prices than the present; and the question arises whether the farmer can again get round the Government to spoon-feed him for another year or so. Present conditions will continue until the end of May; but I should imagine that the old law of supply and demand will then come into operation, in which case a rising tendency may be expected in sulphate. Particulars have just been made available of a scheme for co-ordinating and extending the work of the Sulphate of Ammonia Association by the formation of the British Sulphate of Ammonia Corporation. As regards the home trade, the proposals will probably be sympathetically received and considered by manufacturers, although there may be some disapproval of the method of financing the trade. But with regard to Foreign and Colonial exports, some criticism may be looked for. Already exporters have communicated to many makers their proposed terms for transacting overseas business. These are admitted to be reasonable and fair; and it seems to many makers unwise for the new organization to discard known trading channels which might be immediately used by other countries possessing an exportable surplus but having no knowledge of the world trade in sulphate. The whole position has undergone a complete and radical change during the war. In this connection, the following facts and figures are worth noting. In July, 1914, the ruling level was approximately £11 per ton, and recent fixed prices of £16 or so per ton are by no means in keeping with the enormously increased cost of production, and even less so in comparison with nitrate of soda, which from £10 or £11 per ton was selling at £27 in November last, since when the price for agricultural purposes has been fixed at £20. The production of sulphate in this country in 1914 was 426,000 tons, of which 60,000 tons were consumed at home and about 314,000 tons were exported—very largely to Japan, with the position in which country I dealt fully in a recent report; the remainder being in the form of concentrated ammoniacal liquor. Last year home consumption had increased to 238,000 tons; but exports dropped to below 20,000 tons. The domestic demand for 1918-1919 is estimated at about 250,000 tons. Now, the productive capacity of the three leading producing countries has increased in the aggregate from 1,154,500 tons in 1914 to 2,066,000 tons in 1918—roughly, by 90 p.ct.; and we must bear in mind that synthesis of ammonia may be practised on a largely extended scale. There is little sign at present; but if costs of production come down, it may happen, and must accordingly be considered. Consequently competition in such available markets as we formerly held, even allowing for an increased consumption of the product, is bound to be very severe. To meet this, improved methods of marketing the output of British manufacturers would appear to be absolutely necessary; but whether the new scheme of the Sulphate of Ammonia Association is the best that can be done remains to be seen. Many makers say that their foreign trade must not be jeopardized by premature, hasty, and unwise action. Their old exporters have served them well and know their subject; while the new organization is not so well versed (and is certainly unknown), and cannot compete on the question of cost to the maker. These remarks must not be taken as a personal or editorial criticism. They are suggested by, and based entirely on, comments in trade circles.

The report of Waste Heat and Gas Electrical Generating Stations, Ltd., for the year ended Jan. 31 states that the profits, after deducting administration expenses, amounted to £38,646, against £40,731 in the previous year. The Directors have transferred to reserve account £12,500, leaving £26,146; and they recommend a dividend at the rate of 8 p.ct. for the year, carrying forward £17,587. The amount to the credit of the reserve account is now £100,351. The redemption fund, in respect of plant supplied on hire-purchase terms, amounts to £37,210. Capital expenditure during the year amounted to £14,096—mainly in connection with the new power station at Horden. Units generated at all the power stations other than Teesbridge, which has been closed-down throughout the year, show a reduction of about 4 p.ct.

Fraudulent Consumption of Gas.

A Newburn man, named Richard Bell, was charged at the Moot Hall Police Court with having fraudulently consumed gas by means of a rubber tube attachment to his automatic meter. The excuse he gave was that his daughter was ill, and he had not a penny to put in the meter. An inspector in the employ of the Newcastle and Gateshead Gas Company expressed the opinion that the gas had been used by this means for at least ten days. Mr. Gerard Fenwick (the Chairman) said that, owing to the difficulty of proving the length of time this fraudulent consumption of gas had been going on, the defendant would be fined £5 on the charge of having improperly used the gas, and £2 for the day on which he admitted the offence had continued. Defendant would also be fined £2 for having made the attachment to the meter—£9 in all. The fact that gas was rationed, he said, made the offence all the worse.

Dearer Gas at Exeter.—The price of gas at Exeter has been advanced 6d. per 1000 c.ft., and the quantity supplied through slot-meters reduced 3 c.ft. for 1d. In giving notice of these changes, the Directors of the Company say they are owing to the large increase in the cost of manufacture.

Gas-Workers' Wages at Tiverton.—The Lighting Committee of the Tiverton Corporation decided last week to advance the wages of labourers and fitters at the gas-works by 2d. per hour as from Feb. 1. With regard to the stokers, it is stated that they are being paid at a higher rate than those in similar works in the West of England.

Woking District Gas Company.—It was reported at the recent meeting of the Company that, for the year ended Dec. 31, the receipts from the sale of gas showed an increase of 18·83 p.ct. over 1917, and sales of residual products a decrease of 1·95 p.ct. The revenue for the year was £30,096, and the expense on revenue account £25,183, leaving a net profit of £4913, to which must be added the balance brought forward from last account (£1857). After making the usual charges for interest, &c., writing £500 off the cost of the Special Act, and deducting the September dividend, there remained an available balance of £3611 at the credit of profit and loss. The Directors recommended the payment of final dividends on the preference stock at the rate of 5 p.ct. per annum, and on the "A" and "B" ordinary stocks at the rate of 5½ p.ct. per annum, which would absorb £1739, and leave £1871 to be carried forward. Mr. Samuel Spencer, who presided at the meeting, said the balance-sheet was very satisfactory. Mr. F. J. Bancroft, in returning thanks for his re-election as a Director, said that, while coal and labour had increased in price 100 p.ct., and oil from 400 to 500 p.ct., the public could hardly accuse the Company of profiteering when they only increased the price of gas 25 p.ct. Thanks to the management of the Engineer (Mr. W. H. Ely) the Company's relations with labour had been very good.

Leamington Priors Gas Company.

In submitting the accounts which were adopted at the half-yearly meeting of the Company, the Directors said that the increase in the price of coal and in wages, and the falling-off in gas consumption, had caused them much anxiety; and they regretted that they were only able to recommend the payment of the usual dividends (at the rates of 10 and 7 p.ct. per annum on the different classes of shares) by a call on the accumulated resources. The numbers of ordinary and prepayment meters and cookers increased slightly; and during the Michaelmas quarter there was a gain in the quantity of gas sold. But under the operation of the Household Fuel and Lighting Order, the output decreased during the Christmas quarter; the net result for the half year being a reduction of 7 p.ct. in the quantity of gas sold. The Chairman (Dr. T. W. Thursfield) said the Board's policy in the past, of accumulating ample stocks of coal, had proved of incalculable benefit to the consumers, as during the last two years their stocks had been depleted by over 6000 tons, and without this reserve the town would very likely have been without gas altogether. Though there was a slight decrease in the number of employees, as compared with 1914, the wages bill had increased from £8880 in that year to £14,827. The present price of gas (3s. 5d. per 1000 c.ft.) was one upon which consumers could congratulate themselves—it being an advance of only 11d., or 37 p.ct., over 1914. With regard to the future, heavy expenditure would be necessary on larger mains, when the housing scheme now under consideration was carried out.

New Geysers, Ltd., has been registered as a private company, with a capital of £2000 in £1 shares. Of this, £1000 is to be in 7 p.ct. non-cumulative preference.

Technical Chemists and Whitley Councils.—Mr. S. R. Todd, of the Ministry of Labour, addressed a meeting of chemists at Manchester last Tuesday, on the question of the representation of technical chemists on Industrial Councils. The meeting was convened by the Manchester Section of the British Association of Chemists. Mr. Todd held that the opposition to such representation came chiefly from the trade unions, on the ground that chemists were, by reason of their occupation, largely on the side of the employers. While admitting that the problem was not one easy of solution, he approved of a scheme which had recently been drafted. It was proposed that an Industrial Council should be set-up, comprising employers' representatives on the one hand, and on the employees' side representatives of technical organizations and trade unions. Questions of wages and hours of labour affecting chemists should be dealt with by the employers and the chemists' representatives, and such matters affecting the workmen would be considered by the employers and the workmen's representatives. Other matters of general interest to all parties would be dealt with by the Council as a collective body.

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Rhode Island and Municipal Ownership.

By a measure introduced in the State Legislature by Mr. De Pasquale, of Providence, Rhode Island, there is proposed the creation of a Special Commission to conduct a thorough investigation into the costs of manufacturing gas, and to report to the General Assembly at the January session next year on the value of all gas-making plants in the State. The Commission, which would consist of five members, appointed by the Governor, is directed also to report upon the advisability of the acquisition by the State of all gas-manufacturing properties. The proposed measure was referred to the Judiciary Committee. The Commission would ascertain the value of all public and private plants devoted to the manufacture of gas for consumers of the State, with a view to arriving at the probable cost to the State should it desire to purchase them. Further, they would consider the probable cost, under public ownership, of gas for heating, power, and lighting purposes; the expense of pipe-lines for conducting gas from sea-coast gas manufacturing plants to interior towns and cities of the State; and all questions relating to the advisability of using bituminous coal to be converted into gas, the cost as compared with anthracite coal, and the income probable from residuals recovered in the making of the gas. Full authority would be given to the Commission to require the production of books, papers, and any information from each public and private company or corporation making gas for sale to the inhabitants of the State.

Vertical Retorts for Halifax.—The Halifax Corporation Gas Committee have accepted the tender of Messrs. Drakes, Ltd., for the supply and erection of a stack of six beds of vertical retorts at the gas-works, for the sum of £40,950.

Increase in Gas Prices at Rochdale.—At a meeting on Friday, the Gas Committee of the Rochdale Corporation decided to recommend an increase in the price of gas of 10d. per 1000 c.ft. for all purposes. The price for lighting will then be 5s. per 1000 c.ft.

Criticism at Staveley.—At the annual meeting of the Staveley Gas Company, Ltd., Mr. F. Hardwick (the Chairman and Managing-Director), in moving the adoption of the report and accounts, said the available balance, after allowing for debenture interest and other charges, and including £1251 brought forward, was £1839, compared with £1680 for the previous year. The Directors recommended a dividend of 5 p.ct. on the original and 3½ p.ct. on the additional shares (both less income-tax), compared with 7 and £4 18s. p.ct. for the year before. Mr. Peat seconded, and referred to the fact that, by decreasing the dividend, the Directors were hoping to consolidate the financial position of the concern. The Directors had also voluntarily sacrificed their fees for the year, as well as the previous year's arrears. Criticism of the balance-sheet was offered; one shareholder complaining particularly of the prospects held out at the sale of the new shares, as only one dividend at the rate stated had been paid. Ultimately the report and balance-sheet were adopted.

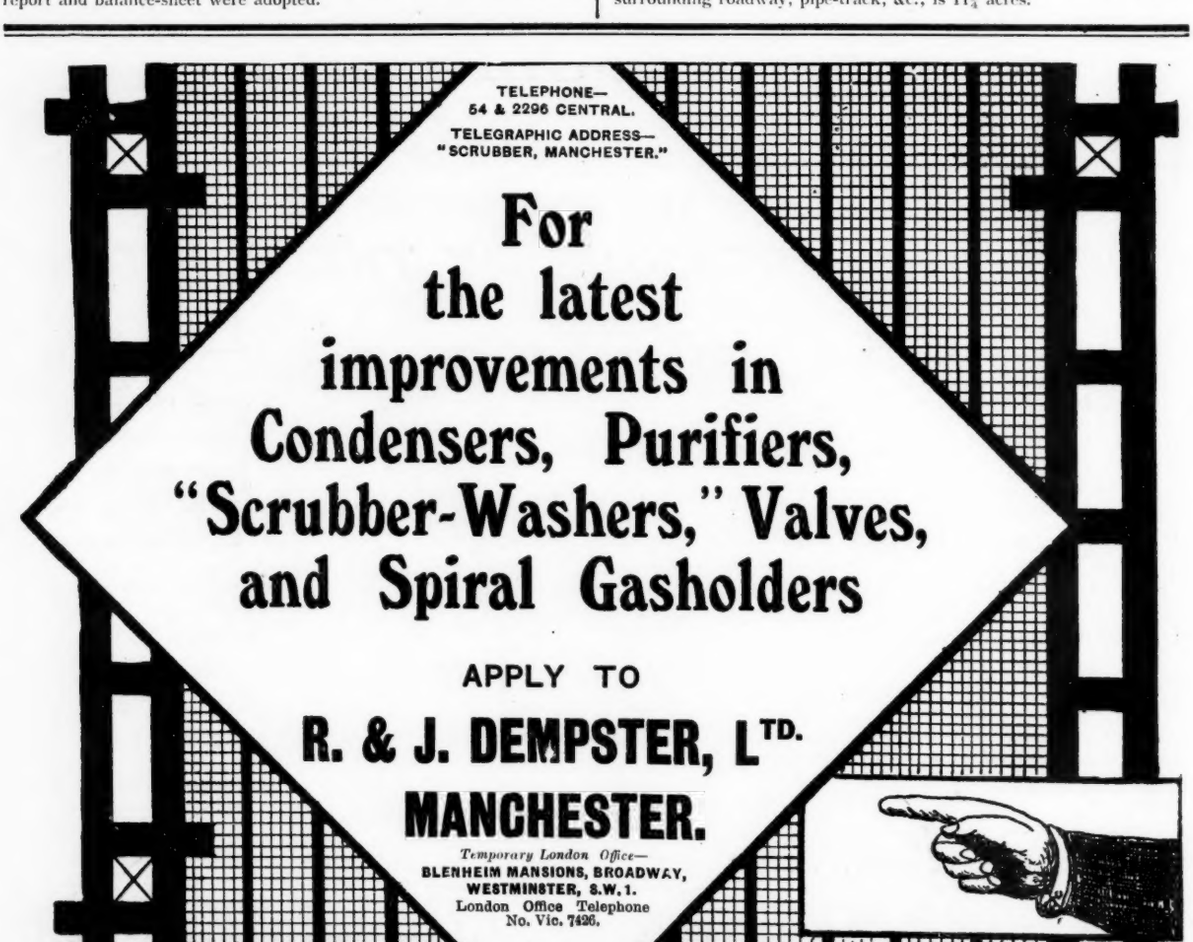
Action against the Gas Light and Coke Company.

In the Bow County Court, last Tuesday, before his Honour Judge Graham, K.C., Mary Ann Archer, a labourer, sought to obtain an award under the Workmen's Compensation Act against the Gas Light and Coke Company, for an injury received on Aug. 22. It appeared that the girl had only been in the respondents' employ for five weeks, and was engaged in shovelling oxide, when she slipped on the concrete floor, and sustained injury to the left knee. Synovitis set in, and she was laid up for a number of weeks; but the respondents suggested that she had fully recovered on Jan. 24 last. The plaintiff said she was incapable of doing any hard work, such as shovelling, but agreed that she could do light work, if there was any to be had, which was very unlikely. A great deal of medical evidence was given; and Judge Graham then consulted the Medical Assessor, who was sitting with him, and finally entered judgment for the respondents with costs.

Gas-Meter Makers' Wages.—A Court of Arbitration sitting at Old Palace Yard, Westminster, recently heard a claim by the National Union of General Workers for an increase on piece rate of 33 p.ct., and a minimum wage of 10d. per hour for time workers for men employed in the gas-meter making industry. By an award of the Court issued on Saturday, men on piece work are to receive an advance of 10 p.ct. on piece-work prices. The Court stated that the claim in regard to time workers had not been established.

German Workers and Nationalization.—The "Board of Trade Journal" says that the employees of the Farbenfabriken vorm Friedrich Bayer & Co., numbering more than 2000, have sent to Chancellor Ebert a telegram to the effect that an eventual nationalization of the dye and drug industry would bring enormous harm to Germany. They say, among other things, that Germany's chemical industry owes its dominant position in the world markets to the speculative chemical investigations extending through many years, the tireless technical labours in the factories, and the energy of the German salesmen abroad. A nationalization of these establishments would be the most radical and the surest means to ruin them in the shortest time possible.

Admiralty's Huge Oil Fuel Reservoir.—The construction of a large reservoir at Rosyth for the storage of oil fuel for H.M. ships in the Firth of Forth has recently been completed by the Admiralty. The reservoir is built of concrete on a rock foundation; the site being the bed of the sandstone quarry known as Howe Cove, from which stone was quarried for the purpose of building the new dockyard. The use of concrete as a material of construction for oil reservoirs of large size is a novelty. The concrete deposited amounted to about 98,500 cubic yards. The total amount of rock excavation carried out in the construction of the two sections of the reservoir was upwards of 300,000 cubic yards. The combined capacity of the two sections is about 60 million gallons; and the area occupied by the reservoir and surrounding roadway, pipe-track, &c., is 11¼ acres.



Torquay Gas Company's Diamond Jubilee.

Mr. A. Iredale, presiding at the annual meeting of the Torquay Gas Company, referred to the fact that the undertaking had reached its "Diamond Jubilee." Sixty years ago the capital was £18,300; to-day it is £115,868. The price of gas in 1860 was 6s. per 1000 c.ft.; at the commencement of the war it was 2s. 8d.; now, by force of circumstances, it is 4s. 3d. Coal has gone up from 18s. to 37s. 9d. per ton. While in 1860 the wages paid to the men at the works were 18s. per week, and for the whole year amounted to £460, to-day the average is £2 14s. 4d. per week, and the total for the year has risen to £9625. For the past year the cost of coal had been £25,405, as compared with £22,965 in 1917. Wages for carbonizing alone advanced from £3665 to £4659. If men would work according to their capacity and strength, little fault could be found with the increase in wages; but the false economy of trade union regulations limiting output and degrading the good workmen to the standard of the indifferent one, was simply ruinous. The total wages paid by the Company amounted in 1914 to £5978, and in 1918 to £9652; and the cost of maintenance advanced from £4360 to £6035. The total expenditure last year was £48,518, and the receipts £56,184. Year by year during the war it had been necessary to increase the price of gas, until now it had reached the maximum. The question of the rating of the undertaking had received careful consideration; and negotiations were in progress from which the Directors hoped the Company would receive some relief. The accounts, which showed a balance of £8762 to the credit of profit and loss, were adopted, and 10 and 7 p.ct. dividends on the two classes of shares were declared.

War Increase at Abertillery.—The Abertillery Urban District Council have considered an application made by the National Association of Local Government Officers for payment of a war increase of £75 per annum, exclusive of any increases granted during the war on account of merit or increased duties to all the adult officials of the Council. The application was granted.

Exmouth Gas Company.—At the Exmouth Gas Company's annual meeting, the usual dividend was declared. The sales of gas showed a slight decrease on those of 1917; the difference being equal to 4 p.ct. The Chairman said the aim of the Directors had been to remodel the works under the advice of the Manager (Mr. W. E. Dean), and to bring the plant up to date.

Higher Yorkshire Prices.—The Barnsley Gas Company have advanced the price of gas to out-districts 10d. per 1000 c.ft. for lighting, 1s. 1d. for fires, and 11d. for engines and industrial plant. The increase within the borough is 1d. per 1000 c.ft. for engines and power, and 3d. for fires and cooking. The Doncaster Corporation, in committee, have advanced the charge for gas 3d. per 1000 c.ft. The price is now 4s. per 1000 c.ft. as against 2s. 2d. pre-war. The Gomersal Gas Company have advanced the charge for gas 4d. per 1000 c.ft. to all classes of consumers, from the meter readings for the quarter ending March. The Drighlington and Gildersome Gas Company, a neighbouring concern, have raised their charge by a further 3d. per 1000 c.ft. to all consumers.

Added Financial Strength at Cromer.—Submitting the accounts for the past year, the Directors of the Cromer Gas Company report with great satisfaction that the undertaking has come through all its attendant disabilities and losses with added financial strength and stability. Given a return of normal conditions in the future, they look forward to the Company securing year by year an increasing share of the prosperity that it is anticipated the East Coast towns and residential districts will enjoy following upon the completion of a lasting peace. The accounts show that the gas sold increased over the sales for the previous year by 427,000 c.ft., or 1·5 p.ct. The revenue account had to sustain the burden of further abnormal additions to expenditure, principally for coal and labour; and the enhanced cost of production has been partially met by raising the price of gas 3d. per 1000 c.ft. from Michaelmas last. After providing for interest, income-tax, and all other charges, and writing-off £500—the final instalment of the suspense account for old works—there remains a balance of profit of £1078 available for division. The Directors accordingly recommend the declaration of a dividend for the year of 2 p.ct. (less income-tax)—a rate of distribution that has not been reached for the past nine years. This will leave a balance of £190 to the credit of profit and loss account to be carried forward.

Gas-Works Extensions at Colchester.—With a balance on the revenue account amounting to £3697, the Directors of the Colchester Gas Company recommended at the recent half-yearly meeting the declaration of dividends at the rates of 10 p.ct. per annum on the "A" shares and 7 p.ct. per annum on the "B" shares (less income-tax). They stated in their report that the consumption of gas during the year showed an increase of 2½ p.ct. Permission was obtained for the erection of new purifiers; and the first section of the work has now been completed. The Directors propose to proceed with a considerable scheme for new retorts, together with coal and coke handling machinery, for which purpose it will be necessary to issue additional capital. The existing retort plant was erected in 1876, and is obsolete in design, as well as insufficient for the growing business of the Company. In order to obtain the advantages of the most up-to-date retorts and machinery, the Directors propose to build an entirely new retort-house; and they confidently anticipate that the improved results obtained, when the plant is at work, will provide a good return on the capital expended, and will strengthen the position of the Company in meeting future competition. As to this, the Directors drew attention to the fact that after four-and-a-half years of war, the Company have increased their price only 3d. per 1000 c.ft., and have not had to draw on the reserve fund to pay the dividends. This fund amounts to £5242; and, in addition, the Company have a special purposes fund, to meet emergencies or to cover replacement of old plant, amounting to £5572, and a balance on the profit and loss account of £6413 before paying the dividend.

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Jubilee at Batley.—Batley has been celebrating the jubilee of its incorporation. A review of the municipal undertakings recalled that until 1873 Batley and the neighbouring borough of Dewsbury were joint owners of the gas producing and distributing systems of the two towns. Then the partnership was dissolved, and Batley took its share of the undertaking, at a cost of £189,000. Part of the capital outlay has since been repaid. But there has been considerable added expenditure; and the investment to-day is calculated as £195,500. The municipal gas undertaking is regarded as one of the town's most valuable assets.

An Income-Tax Commission.—The King has approved the appointment of a Royal Commission on the Income-Tax, with the following terms of reference: "To inquire into the income-tax (including super-tax) of the United Kingdom in all its aspects, including the scope, rates, and incidence of the tax; allowances and reliefs; administration, assessment, appeal, and collection; and prevention of evasion; and to report what alterations of law and practice are in their opinion necessary or desirable, and what effect they would have on the rates of tax if it were necessary to maintain the total yield." Lord Colwyn is to be the Chairman.

Price of Gas at Glasgow.—At a meeting of the Finance Sub-Committee of the Glasgow Corporation Gas Committee, it was agreed to recommend that the gas rate be advanced 3d. per 1000 c.ft. This will make the domestic rate 4s. The increase will come into force from the next survey of gas-meters, which begins on the 17th inst. It is stated that this increase is rendered necessary by the extra expense attendant upon the introduction of a 48-hour working week.

Shipley Gas-Works Deficit.—At a meeting of the Shipley District Council last week, when the rates were increased by 2s. 2d. in the pound, it was stated that the gas undertaking showed a deficit of £6163, which, as the maximum price was already being levied, had to be made a charge on the district rate; and this item accounted for 1s. of the increase. The Chairman of the Council (Mr. T. Hill) said the unfortunate position of the gas undertaking was due entirely to the high price originally paid for the works and supply rights. The loan charges alone amounted to over 2s. 1d. per 1000 c.ft. of gas. The Council who had purchased the works had left an enormous legacy of debt. The concern was now doing as well as any other works, so far as concerned manufacturing costs; but they were overburdened with capital debt.

STOCK MARKET REPORT.

THE Stock Exchange last week did not turn to much account the rather promising indications discernible at the close of its predecessor. Business was decidedly sluggish and devoid of interest, and some of the leading departments went but heavily. Not as much as might fairly have been expected was made of the success of the Sankey report and the clearer atmosphere of the labour horizon.

In the gilt-edged market, Home Government issues were flat. The 5 p.ct. War Loan still held on to 95; but Consols had a large fall, and closed at about 56. Some Colonials were steady; but Indians were weak. Home Rails, reflecting on the price to be paid for industrial peace, did not revive much.

Among the Miscellaneous Group, Oils were active and in good request, and Iron and Steel undertakings were in favour. The relaxation of Government restrictions has opened the door to many invitations to the public to embark in industrial adventures.

Business in the Gas Market fell off rather in point of activity from the level of the week before, so far as regards the official list of quoted undertakings; but a noteworthy feature of the week was the growing record of bargains recorded in unquoted securities, as set forth below. The tendency on the whole was fairly steady; the few changes in quotation which occurred being mostly *ex div.* variations. In Metropolitans, Gas Light and Coke and South Metropolitan were unchanged, though actual prices were a shade easier. Commercial was firm. In Suburbans and Provincials, the all-round tone was steady. The Continental undertakings were little dealt in, and showed no change. Primitivas had a further fall, in view of the position of affairs set forth at their meeting last Tuesday.

Bargains done for cash during the week were as follows: On Monday, Bombay 6 1/16, British 32, 32¼, Gas Light ordinary 62, 62¼, 62½, 63, ditto maximum 55½, ditto preference 71½, Imperial Continental 116½, 117½, South Metropolitan 65, Southampton 70, Bath 5 p.ct. maximum 82½, 83, Eastbourne 3½ p.ct. "B" 57½, 57⅝, Harrow and Stanmore 5 p.ct. 79, 79½, ditto 5 p.ct. debenture 60, 60½. On Tuesday, Cape Town preference 7 13/16, ditto debenture 63½, Gas Light ordinary 62½, 62⅝, 63, 63¼, Imperial Continental 116, 116½, 116⅝, 117, Primitiva 29s., South Metropolitan 64⅝, Cheltenham 77, 77½, Hertford 14, 14⅛, Monte Video 5 p.ct. debenture 73. On Wednesday, Alliance and Dublin debenture 63, Brentford debenture 65⅝, 66, Commercial 4 p.ct. 63, Gas Light ordinary 62, 62⅜, 62½, 62⅝, 62¾, ditto maximum 55½, 56, ditto preference 71½, ditto debenture 50½, 57, Imperial Continental 116, 117, Primitiva 25s., San Paulo preference 8, South African 13, South Metropolitan 64, 65, ditto debenture 55, 55⅛, Peterborough 94½, 95. On Thursday, Gas Light ordinary 62¼, 63¼, Imperial Continental 116, 116½, Oriental 104½, Primitiva preference 42s. 6d., South Metropolitan 64, 65, Tuscan 35s., 36s. 3d., Wandsworth "B" 72, ditto new ordinary 71. On Friday, Commercial 4 p.ct. 63⅞, Croydon "B" 130, Derby Con. Stock 89, 90, Gas Light ordinary 62, 62¼, 62⅜, ditto preference 70½, 70⅝, 71, 71½, Imperial Continental 116, 116½, 117, Primitiva 27s. 6d., ditto preference 45s., South Metropolitan 64, 65, Southampton 70½.

In the Money Market, rates opened and closed fairly easy; but intermediately there was some pressure.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Shares.	When ex-Dividend.	Ante-War Dividend & Bonus. p.c.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
182,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	62–67	..
1,551,868	"	April 8	2½	4⅛%	Alliance & Dublin Ord.	59–64	49–51	..
874,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76–79	61–63	63
280,000	5	April 29	7½	8%	Bombay, Ltd.	5⅞–6⅜	6⅝–6¾	6 1/16
50,000	10	Feb. 26	16	12%	Bournemouth Gas and Water { 10 p.c.	29–30	21–23	..
888,110	10	"	7	7%	B 7 p.c.	15–15½	10–11	..
115,000	10	"	6	6%	Pref. 6 p.c.	13½–14	9–9½	..
159,740	—	—	—	4%	4 p.c. Deb.	..	66–68	..
992,045	Stk.	Feb. 26	14	37/-	Brentford A Consolid.	261–266	76–79	..
784,920	"	"	11	31/8	Do. B New	204–209	70–75	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109–111	75–80	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91–93	64–66	65½–66
217,380	"	Feb. 26	11	74⅓%	Brighton & Hove Orig.	208–213	137–142*	..
244,200	"	"	8	5⅓%	Do. A Ord. Stk.	154–159	95–100*	..
983,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
580,000	20	Mar. 26	13½	10%	British	44–45	30½–31½*	32–32½
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	58–60	64–66	..
845,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	55–57	50–53	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½–2½	3½–4½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4–6	7½–8½	7 13/16
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70–75	60–65	63½
157,180	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108–110	..	..
1,518,280	"	Feb. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106–108	62–65	63–63½
850,000	"	"	5⅞	29/3	Do. 3½ p.c. do.	103–105	59–62	..
476,000	"	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½–71½	51–53	..
800,000	"	"	4	—	Continental Union Ltd.	75–79	48–53	..
900,000	"	"	7	—	Do. 7 p.c. Pref.	115–118	70–75	..
51,600	Stk.	Aug. 29	14½	12½%	Croydon A 10 p.c.	..	155–165	..
279,400	—	"	11½	9⅞%	Croydon B and C 7 p.c.	..	180–185	180
473,270	Stk.	—	6	5⅛%	Derby Con. Stk.	128–135	..	89–90
55,000	"	—	4	4%	Do. Deb. Stk.	103–104	..	..
1,009,180	10	July 29	10	6/-	European, Ltd.	17½–18	12⅜–13½	..
16,398,975	Stk.	Feb. 10	4/17/4	30/-	Gas Light and Coke { 6 p.c. Ord.	98–102	62–64	62–63½
2,600,000	"	"	8½	26 8	5½ p.c. max.	76–79	55–57	55½–56
4,069,235	"	"	4	4%	4 p.c. Con. Pref.	96–99	70–72	70½–71½
4,674,850	"	June 11	8	8%	5 p.c. Con. Deb.	72½–74½	56–58	56½–57
180,000	"	"	10	10%	10 p.c. Bonds	..	..	..
32,500	"	Mar. 12	5	4⅓%	Hastings & St. L. 5 p.c.	..	59–64	..
258,740	"	—	3½	2⅔%	Do. 3½ p.c.	87–89	44–49	..
70,000	10	April 29	11	8%	Hongkong & China, Ltd.	16½–18½	7½–8½	..
86,600	Stk.	Sept. 12	9	8⅓%	Hornsey 7 p.c.	..	115–120	..
181,000	"	Mar. 12	7½	6⅔%	Ilford A and C.	151–154	90–96	..
65,780	"	"	6⅔	4⅓%	Do. B	115–118	69–74	..
65,500	"	June 26	4	4%	Do. 4 p.c. Deb.	92–94	62–65	..
4,940,000	"	May 14	9	4½%	Imperial Continental	150–160	116–121	116–117
1,235,000	"	Feb. 12	8½	5⅔%	Do. 5½ p.c. Deb. Red.	84–86	72–74	..
285,943	"	Mar. 12	6½	6⅓%	Lea Bridge Ord. 5 p.c.	119–121	90–95*	..
2,498,906	"	Feb. 26	10	42/6	Liverpool 5 p.c. Ord. { A	211–218	..	..
						146–148		..
808,088	"	June 26	4	4%	Do 4 p.c. Pr. Deb. Stk.	..	..	..
165,786	"	Feb. 17	7/5/6	32½%	Maidstone 5 p.c.	..	58–63	..
75,000	5	June 11	5	5%	Malta & Mediterranean	4½–4⅝	8½–8¾	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99–101	90–97	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½–12	9⅞–9⅞	..
1,876,893	Stk.	July 29	4½	3⅛%	NewcastleGatsh'dCon.	98½–99½	70½–71½	..
529,705	"	June 26	3½	3⅛%	Do. 3½ p.c. Deb.	82–83	57–59	..
55,940	10	Feb. 26	1/14/0	7⅓%	North Middlesex 7 p.c.	14–15	9½–9⅞	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117–122	103–106	104½
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½–7⅞	4⅞–5⅛	..
60,000	50	Feb. 26	13	7½%	Porisea, Island B	128–131	76–81	..
100,000	50	"	12	6⅔%	Do. C	118–121	58–63	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛–6	1–1½	25/—29/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4⅝–5	2–2½	42/6—45/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91–98	74–76	..
600,000	Stk.	July 31	4	4%	Do. " 1911	..	46–49	..
346,198	"	June 26	4	4%	River Plate 4 p.c. Deb.	85–87	48–52	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½–11	7⅛–8*	8
125,000	50	July 1	5	5%	5 p.c. Deb.	47–49	40–42	..
185,000	Stk.	Mar. 12	10	5%	Sheffield A	228–234	83–85	..
209,984	"	"	10	5%	Do. B	229–234	83–85	..
528,800	"	"	10	4⅔%	Do. C	230–232	82–84	..
138,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 28	9	6/-	South African	10½–11½	13–14	13
6,609,895	Stk.	Feb. 10	5/4/0	30/-	South Met. 4 p.c. Ord.	111–113	64–67	64–65
250,000	"	July 12	—	5%	Do. Pref.	..	95–97	..
1,895,445	"	July 10	8	8%	Do. 3 p.c. Deb.	73½–74½	54–56	55–55½
224,890	"	Feb. 26	8½	5%	South Shields Con. Stk.	157–159	112–114	..
952,795	"	"	6	3⅔%	S'th Suburb'n Ord. 5 p.c.	114–116	76–79	..
197,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116–118	89–92	..
647,740	"	May 14	8	8%	Southampton Ord.	99–102	69–71	70–70½
190,000	"	Feb. 12	7½	4⅓%	Tottenham District { A 5 p.c.	135–138	90–95	..
782,975	"	"	6	3⅝%	B 3½ p.c.	115–117	65–67	..
181,255	"	June 26	4	4%	4 p.c. Deb.	87–89	64–66	..
189,880	10	Dec. 30	5	—	Tuscan, Ltd.	5–6	1–2	35/—36/3
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93–95	45–50	..
286,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½–109	83–85	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	"	Feb. 26	8⅔	55/-	Wandsworth A 5 p.c.	151–156	88–93	..
255,686	"	"	6½	40/-	Do. B 3½ p.c.	129–134	68–73	72
108,075	"	"	—	38/6	Do. C	..	68–73	..
140,365	"	"	—	3 4/6	New Ordinary	..	68–73	71
262,000	"	"	6½	53/9	Wimbledon 5 p.c.	117–122	64–73	..
96,000	"	"	6½	40/-	Epsom 5 p.c.	121–126	70–75	..
88,416	"	June 26	6	5%	3 p.c. Deb. Stk.	66–69	50–52	..

* *Ex div.*

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for March 26.]

Nos. 6543—7230.

ANDERSON, D.—"Gas-fires." No. 6934.
BOSTEL, F. J.—"Water-heaters or geysers." No. 6665.
BOSTEL, F. J.—"Automatic tap for geysers, &c." No. 6979.
BURNETTE, F.—"Gas stoves or cookers." No. 6745.
CHARLES, W. J.—"Gas-regulators of incandescent burners." No. 7199.
FARROW, W. H.—"Locking-up device for taps." No. 6591.
GROCOTT, F. J.—"Melting-furnaces burning producer gas." No. 6929.
HARGER, J.—"Gas-producers." No. 7182.
HELPS, G.—"Manufacture, utilization, and combustion of fuel." No. 6956.
HICKINBOTTOM, F.—"Gas stoves, fires, &c." No. 6964.
MATHY, M.—"Burner." No. 6649.
MATHY, M.—"Water-heaters." No. 6732.
MAYER, C.—"Manufacture of clay rings for inverted incandescent gas-mantles." No. 6791.
NAAMLOOZE VENNOOTSCHAP WEST-FRISIA MAATSCHAPPIJ TER VERVAARDIGING VAN GASARTIEKELEN VOORHEEN G. SCHILD.—"Flame-spreaders for gas-burners." No. 7190.
PARKINSON STOVE COMPANY.—See Hickinbottom. No. 6964.
PATEMAN, J. W.—"Conveyors for coke, coal, &c." No. 6876.
SNELL, C. SCOTT.—See Anderson. No. 6934.
SUMMERS, E. H.—"Rotary furnaces, retorts, &c." No. 7052.
TILLEY, F. C.—"Vapour burners and lamps." No. 6982.
TILLEY, F. C.—"Inverted incandescent gas-lamps." No. 6983.
VINCENT, G., H., & J.—"Geyser." No. 6847.
WELSBACH LIGHT COMPANY.—See Mayer. No. 6791.
WHITTARD, E. S.—See Summers. No. 7052.

In Paris, where "summer time" has been in operation for the past month, a saving is said to have been effected of 10 p.ct. on gas and 15 p.ct. on electric light.

John Fielden, aged 54, a railway platelayer, of Walsden, near Todmorden, last week met a tragic death by gas. He slept in a little room without a fireplace, and was found dead in bed, with the room strongly smelling of gas, and a small light burning. It was discovered that the gas-bracket was leaking under the joint. At the inquest, there was a verdict of "Accidental death by suffocation with coal gas fumes."

The Ripon gas undertaking, like other similar concerns, has been experiencing many difficulties in recent times; but an attempt in the City Council last week to cast undeserved blame on the Manager met with ignominious failure. Mr. Boddy moved, and Mr. Levin seconded, "That in the interests of the citizens of Ripon, it is desirable that we have a change of manager at our city gas-works." The matter was given the courtesy of a discussion; but on a vote the mover and seconder stood alone, and when a resolution of confidence in the manager was put, Mr. Boddy was the only dissentient voter.

The Birmingham Chamber of Commerce have the arrangements well in hand for the Birmingham Section of the British Industries Fair, which is to be held in February of next year. Three centres have been selected for the purposes of exhibition (they will be held simultaneously for a fortnight); and it is hoped to give a big impetus to overseas trade. Already the use of six of the largest buildings in Birmingham has been acquired for the fair, and not less than 2000 stockrooms will be provided. London will be responsible for the light trades; Birmingham for brass and metal work; and Glasgow for furniture, textile, and food products. Birmingham has been allotted exclusively the section devoted to chandeliers, candelabra, gas-fittings, table lamps, standard lamps, &c.—one to all classes of brassfoundry, and another to general hardware, including brass and copper and iron and steel tubes, pipes, and fittings.

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(See p. 54.)

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Telegrams: "Patent, London." 'Phone: 243 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, Rose Mount Ironworks, Elland.

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NO. 6601, MARCH 4, 1919.

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